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FCC LTE REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
December 07, 2020

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-2010-FC023-R1

FCC ID:	**A3LSMG991U**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-G991U
Additional Model(s):	SM-G991U1
EUT Type:	Mobile Phone
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§90, §22, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	Conducted Output Power	
				Max. Power (W)	Max. Power (dBm)
LTE – Band26 (1.4)	814.7 – 823.3	1M10G7D	QPSK	0.279	24.45
		1M09W7D	16QAM	0.248	23.95
		1M10W7D	64QAM	0.188	22.74
		1M09W7D	256QAM	0.092	19.63
LTE – Band26 (3)	815.5 – 822.5	2M71G7D	QPSK	0.281	24.49
		2M71W7D	16QAM	0.251	24.00
		2M70W7D	64QAM	0.187	22.72
		2M71W7D	256QAM	0.091	19.61
LTE – Band26 (5)	816.5 – 821.5	4M49G7D	QPSK	0.284	24.53
		4M52W7D	16QAM	0.251	24.00
		4M50W7D	64QAM	0.191	22.81
		4M53W7D	256QAM	0.092	19.64
LTE – Band26 (10)	819.0	8M95G7D	QPSK	0.284	24.53
		8M99W7D	16QAM	0.254	24.05
		8M98W7D	64QAM	0.186	22.69
		8M98W7D	256QAM	0.090	19.54
LTE – Band26 (15)	821.5	13M5G7D	QPSK	0.282	24.50
		13M5W7D	16QAM	0.243	23.86
		13M5W7D	64QAM	0.185	22.68
		13M5W7D	256QAM	0.092	19.62

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.
HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

REVIEWED BY

Report prepared by : Jae Ryang Do
Engineer of Telecommunication Testing Center

Report approved by : Kwon Jeong
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *.
The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

* The report shall not be reproduced except in full(only partly) without approval of the laboratory.

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2010-FC023	October 29, 2020	- First Approval Report
HCT-RF-2010-FC023-R1	December 07, 2020	- Revised the Antenna Polarization of ERP

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

Table of Contents

MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSMG991U
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§90, §22, §2
EUT Type:	Mobile Phone
Model(s):	SM-G991U
Additional Model(s):	SM-G991U1
Tx Frequency:	814.7 MHz – 823.3 MHz (LTE – Band 26 (1.4 MHz)) 815.5 MHz – 822.5 MHz (LTE – Band 26 (3 MHz)) 816.5 MHz – 821.5 MHz (LTE – Band 26 (5 MHz)) 819.0 MHz (LTE – Band 26 (10 MHz)) 821.5 MHz (LTE – Band 26 (15 MHz))
Date(s) of Tests:	September 23, 2020 ~ October 27, 2020

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS, CDMA(BC0, 1, 10) and LTE, Sub6.

It also supports IEEE 802.11 a/b/g/n/ac/ax (HT20/40/80), Bluetooth, BT LE, NFC, WPT, mmWave(n260/261).

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA**.

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Channel Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- KDB 971168 D01 v03r01 - Section 5.2.4 - ANSI C63.26-2015 - Section 5.2.1 & 5.2.4.2
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 CONDUCTED OUTPUT POWER

Test Overview

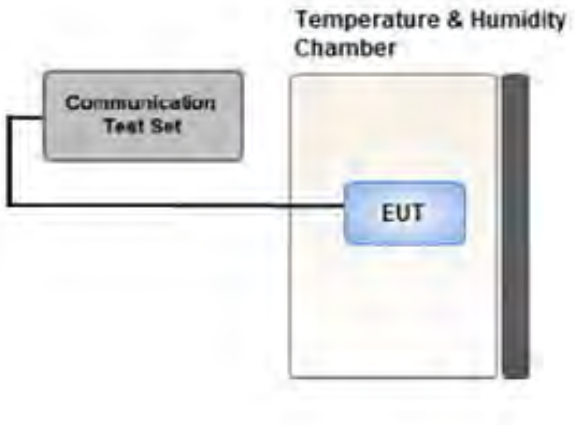
According to ANSI C63.26-2015 Section 5.2.1 when measuring the maximum RF output power from such devices, control over the EUT must be provided either through special test software (provided by manufacturer specifically for compliance testing, but not accessible by an end user) or through use of a base station emulator, communications test set, call box, or similar instrumentation that is capable of establishing a communications link with the EUT to enable control over variable parameters (e.g., output power, OBW, etc.).

In some cases, these instruments also include basic digital spectrum analyzer and/or power meter capabilities that can be utilized to measure the RF output power if the specified detectors and requirements can be realized and the measurement functions have been calibrated.

Test Procedure

1. The RF port of the EUT was connected to the Communication Tester via an RF cable.
2. Conducted average power was measured using a calibrated Radio Communication Tester.

Test setup



3.3 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

   The power is calculated by the following formula;

$$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

   Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.
3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration
4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

3.4 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.
Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10^{th} harmonics from 9 kHz.

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data
3. For spurious emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
   The spurious emissions is calculated by the following formula;

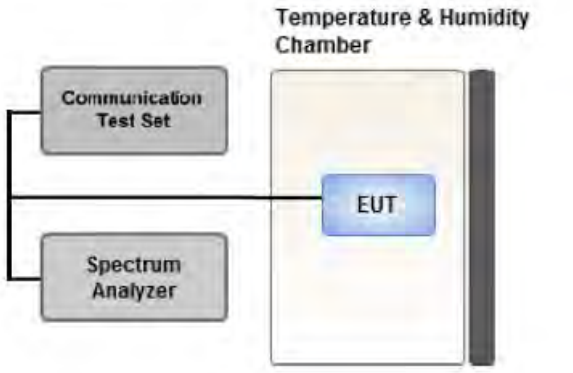
$$Result_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   Where: $P_g$is the generator output power into the substitution antenna.

   If the fundalmatal frequency is below 1GHz, RF output power has been converted to EIRP.

$$EIRP_{(dBm)} = ERP_{(dBm)} + 2.15$$

3.5 OCCUPIED BANDWIDTH.



Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

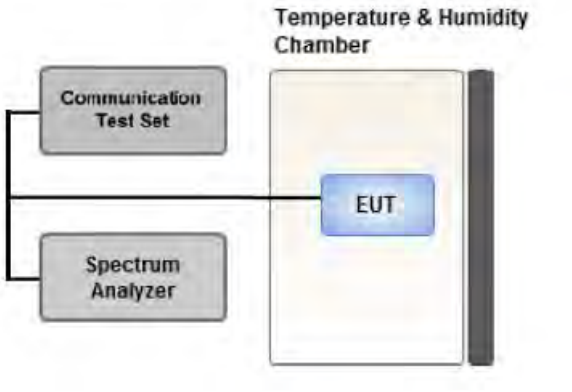
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

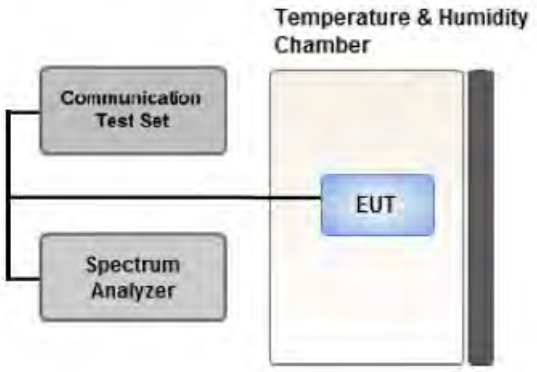
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Settings

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

3.7 CHANNEL EDGE



Test setup

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

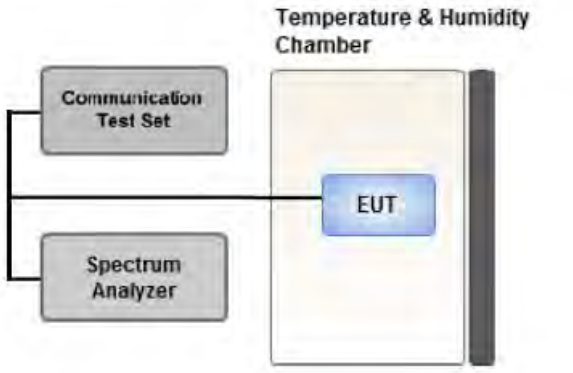
Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW :
   .- EA licensee's frequency block by up to and including 37.5 kHz : 300Hz
   .- EA licensee's frequency block greater than 37.5 kHz : 100kHz
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Notes

For 90.691(a), RBW=300 Hz for offset less than 37.5 kHz from channel edge and RBW=100 kHz for offsets greater than 37.5 kHz is allowed.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:

   The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

2. Primary Supply Voltage:

   .- Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.

   .- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

3.9 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- All modes of operation were tested and the worst case results are reported.
- Please refer to the table below.
- SM-G991U & additional models were tested and the worst case results are reported.

(Worst case : SM-G991U)

[Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	1	0	Y
Radiated Spurious and Harmonic Emissions	QPSK	1	0	Y

3.10 WORST CASE(CONDUCTED TEST)

-Worst case : Of all modulation, We have tested modulation of the high Conducted Output Power.

- SM-G991U & additional models were tested and the worst case results are reported.

(Worst case : SM-G991U)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	1.4, 3, 5	High	Full RB	0
	QPSK, 16QAM, 64QAM, 256QAM	10, 15	Mid	Full RB	0
Channel Edge	QPSK	1.4	Low	1	0
			High	1	5
		3	Low	1	0
			High	1	14
		5	Low	1	0
			High	1	24
		10	Mid	1	0
				1	49
		15	Mid	1	0
				1	74
		1.4, 3, 5	Low, High	Full RB	0
		10, 15	Mid	Full RB	0
Band Edge (Staddle Channel)	QPSK	1.4	Mid	1	5
		3	Mid	1	14
		5	Mid	1	24
		10	Mid	1	49
		15	Mid	1	74
		1.4, 3, 5 10,15	Mid	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	1.4, 3, 5	Low, High	1	0
		10, 15	Mid	1	0

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
T&M SYSTEM	FBSR-02B(WHK1.2/15G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
T&M SYSTEM	FBSR-02B(WHK3.3/18G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/27/2020	Annual	04/27/2021
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP/ Dipole Antenna	557	03/29/2019	Biennial	03/29/2021
Schwarzbeck	UHAP/ Dipole Antenna	558	03/29/2019	Biennial	03/29/2021
ESPEC	SU-642 / Chamber	93008124	03/18/2020	Annual	03/18/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	08/29/2019	Biennial	08/29/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	09/25/2019	Biennial	09/25/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/29/2019	Biennial	04/29/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY51110063	04/27/2020	Annual	04/27/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/04/2020	Annual	06/04/2021
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/14/2020	Annual	10/14/2021
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	04/26/2019	Biennial	04/26/2021
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/12/2019	Biennial	03/12/2021
Schwarzbeck	VULB9160/ Hybrid Antenna	760	03/22/2019	Biennial	03/22/2021
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/22/2020	Annual	01/22/2021
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/13/2020	Annual	07/13/2021
KEYSIGHT	N9030B / Signal Analyzer(5Hz~40.0GHz)	MY55480167	06/04/2020	Annual	06/04/2021
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).
3. Model : FSV40/Spectrum
   - Use date of equipment: September 23, 2020 ~ October 12, 2020, October 14, 2020 ~

5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Channel Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §90.691	< 50 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5 kHz of Block Edge	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §22.917(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046 §90.635	< 100 Watts	PASS
Frequency stability / variation of ambient temperature	§2.1055, §90.213 §22.355	< 2.5 ppm	PASS

Note:

1. The same samples were used for SAR and EMC

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Effective Radiated Power	§22.913(a)(5)	< 7 Watts max. ERP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §90.691 §22.917(a)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	PASS

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.

2) During the test , the turn table is rotated until the maximum signal is found.

3) Record the field strength meter's level.

4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.

5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP Sample Calculation

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
20175	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

EIRP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.

2) During the test , the turn table is rotated until the maximum signal is found.

3) Record the field strength meter's level.

4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.

5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW
GSM BW = 249 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W
GSM BW = 249 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W
WCDMA BW = 4.17 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D
LTE BW = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D
LTE BW = 4.48 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

8. TEST DATA

8.1 CONDUCTED OUTPUT POWER

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				814.7MHz		823.3MHz		
				dBm	W	dBm	W	
1.4	QPSK	1	0	24.22	0.264	24.31	0.270	100
		1	3	24.32	0.270	24.45	0.279	100
		1	5	24.28	0.268	24.37	0.274	100
		3	0	24.25	0.266	24.31	0.270	100
		3	1	24.35	0.272	24.35	0.272	100
		3	3	24.33	0.271	24.30	0.269	100
		6	0	23.35	0.216	23.55	0.226	100
	16QAM	1	0	23.64	0.231	23.61	0.230	100
		1	3	23.71	0.235	23.91	0.246	100
		1	5	23.57	0.228	23.95	0.248	100
		3	0	23.53	0.225	23.47	0.222	100
		3	1	23.55	0.226	23.59	0.229	100
		3	3	23.48	0.223	23.61	0.230	100
		6	0	22.44	0.175	22.51	0.178	100
	64QAM	1	0	22.56	0.180	22.50	0.178	100
		1	3	22.60	0.182	22.74	0.188	100
		1	5	22.59	0.182	22.54	0.179	100
		3	0	22.45	0.176	22.40	0.174	100
		3	1	22.55	0.180	22.58	0.181	100
		3	3	22.51	0.178	22.60	0.182	100
		6	0	21.45	0.140	21.58	0.144	100
	256QAM	1	0	19.48	0.089	19.42	0.087	100
		1	3	19.51	0.089	19.62	0.092	100
		1	5	19.52	0.090	19.58	0.091	100
		3	0	19.50	0.089	19.57	0.091	100
		3	1	19.64	0.092	19.51	0.089	100
		3	3	19.48	0.089	19.60	0.091	100
		6	0	19.36	0.086	19.38	0.087	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				815.5MHz		822.5MHz		
				dBm	W	dBm	W	
3	QPSK	1	0	24.31	0.270	24.49	0.281	100
		1	7	24.32	0.270	24.45	0.279	100
		1	14	24.40	0.275	24.45	0.279	100
		8	0	23.39	0.218	23.41	0.219	100
		8	3	23.56	0.227	23.58	0.228	100
		8	7	23.44	0.221	23.51	0.224	100
		15	0	23.49	0.223	23.52	0.225	100
	16QAM	1	0	23.64	0.231	23.69	0.234	100
		1	7	23.85	0.243	23.73	0.236	100
		1	14	23.77	0.238	24.00	0.251	100
		8	0	22.47	0.177	22.52	0.179	100
		8	3	22.59	0.182	22.63	0.183	100
		8	7	22.58	0.181	22.61	0.182	100
		15	0	22.54	0.179	22.54	0.179	100
	64QAM	1	0	22.58	0.181	22.53	0.179	100
		1	7	22.69	0.186	22.67	0.185	100
		1	14	22.67	0.185	22.72	0.187	100
		8	0	21.41	0.138	21.51	0.142	100
		8	3	21.51	0.142	21.63	0.146	100
		8	7	21.50	0.141	21.60	0.145	100
		15	0	21.57	0.144	21.52	0.142	100
	256QAM	1	0	19.42	0.087	19.52	0.090	100
		1	7	19.59	0.091	19.59	0.091	100
		1	14	19.49	0.089	19.58	0.091	100
		8	0	19.43	0.088	19.42	0.087	100
		8	3	19.53	0.090	19.59	0.091	100
		8	7	19.51	0.089	19.61	0.091	100
		15	0	19.45	0.088	19.55	0.090	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				816.5MHz		821.5MHz		
				dBm	W	dBm	W	
5	QPSK	1	0	24.25	0.266	24.51	0.282	100
		1	12	24.32	0.270	24.52	0.283	100
		1	24	24.31	0.270	24.53	0.284	100
		12	0	23.38	0.218	23.51	0.224	100
		12	6	23.51	0.224	23.62	0.230	100
		12	11	23.51	0.224	23.51	0.224	100
		25	0	23.45	0.221	23.54	0.226	100
	16QAM	1	0	23.60	0.229	23.76	0.238	100
		1	12	23.76	0.238	24.00	0.251	100
		1	24	23.72	0.236	23.92	0.247	100
		12	0	22.44	0.175	22.49	0.177	100
		12	6	22.57	0.181	22.68	0.185	100
		12	11	22.57	0.181	22.65	0.184	100
		25	0	22.45	0.176	22.62	0.183	100
	64QAM	1	0	22.53	0.179	22.63	0.183	100
		1	12	22.72	0.187	22.79	0.190	100
		1	24	22.61	0.182	22.81	0.191	100
		12	0	21.45	0.140	21.52	0.142	100
		12	6	21.54	0.143	21.63	0.146	100
		12	11	21.58	0.144	21.62	0.145	100
		25	0	21.48	0.141	21.56	0.143	100
	256QAM	1	0	19.49	0.089	19.51	0.089	100
		1	12	19.57	0.091	19.63	0.092	100
		1	24	19.58	0.091	19.64	0.092	100
		12	0	19.41	0.087	19.51	0.089	100
		12	6	19.51	0.089	19.56	0.090	100
		12	11	19.52	0.090	19.53	0.090	100
		25	0	19.42	0.087	19.50	0.089	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm) 819MHz		Limit (W)
				dBm	W	
10	QPSK	1	0	24.51	0.282	100
		1	24	24.33	0.271	100
		1	49	24.53	0.284	100
		25	0	23.31	0.214	100
		25	12	23.45	0.221	100
		25	24	23.48	0.223	100
		50	0	23.46	0.222	100
	16QAM	1	0	24.05	0.254	100
		1	24	23.81	0.240	100
		1	49	23.71	0.235	100
		25	0	22.36	0.172	100
		25	12	22.43	0.175	100
		25	24	22.52	0.179	100
		50	0	22.43	0.175	100
	64QAM	1	0	22.67	0.185	100
		1	24	22.53	0.179	100
		1	49	22.69	0.186	100
		25	0	21.60	0.145	100
		25	12	21.40	0.138	100
		25	24	21.46	0.140	100
		50	0	21.42	0.139	100
	256QAM	1	0	19.19	0.083	100
		1	24	19.42	0.087	100
		1	49	19.33	0.086	100
		25	0	19.39	0.087	100
		25	12	19.54	0.090	100
		25	24	19.49	0.089	100
		50	0	19.46	0.088	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm) 821.5MHz		Limit (W)
				dBm	W	
15	QPSK	1	0	24.41	0.276	100
		1	36	24.23	0.265	100
		1	74	24.50	0.282	100
		36	0	23.36	0.217	100
		36	18	23.49	0.223	100
		36	39	23.47	0.222	100
		75	0	23.44	0.221	100
	16QAM	1	0	23.65	0.232	100
		1	36	23.78	0.239	100
		1	74	23.86	0.243	100
		36	0	22.42	0.175	100
		36	18	22.61	0.182	100
		36	39	22.63	0.183	100
		75	0	22.53	0.179	100
	64QAM	1	0	22.59	0.182	100
		1	36	22.67	0.185	100
		1	74	22.68	0.185	100
		36	0	21.41	0.138	100
		36	18	21.53	0.142	100
		36	39	21.59	0.144	100
		75	0	21.46	0.140	100
	256QAM	1	0	19.37	0.086	100
		1	36	19.62	0.092	100
		1	74	19.59	0.091	100
		36	0	19.37	0.086	100
		36	18	19.58	0.091	100
		36	39	19.53	0.090	100
		75	0	19.44	0.088	100

8.2 EFFECTIVE RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
814.7	LTE B26/ 1.4 MHz	QPSK	-33.10	30.01	-10.29	1.39	V	< 100	0.068	18.33
		16QAM	-33.60	29.51	-10.29	1.39	V		0.061	17.83
		64QAM	-35.80	27.31	-10.29	1.39	V		0.037	15.63
		256QAM	-37.65	25.46	-10.29	1.39	V		0.024	13.78
823.3		QPSK	-32.36	31.05	-10.25	1.39	V		0.087	19.41
		16QAM	-33.05	30.36	-10.25	1.39	V		0.074	18.72
		64QAM	-34.43	28.98	-10.25	1.39	V		0.054	17.34
		256QAM	-37.34	26.07	-10.25	1.39	V		0.028	14.43

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
815.5	LTE B26/ 3 MHz	QPSK	-32.86	30.24	-10.29	1.39	V	< 100	0.072	18.57
		16QAM	-33.55	29.55	-10.29	1.39	V		0.061	17.88
		64QAM	-35.33	27.77	-10.29	1.39	V		0.041	16.10
		256QAM	-37.69	25.41	-10.29	1.39	V		0.024	13.74
822.5		QPSK	-32.46	30.89	-10.26	1.39	V		0.084	19.24
		16QAM	-33.06	30.29	-10.26	1.39	V		0.073	18.64
		64QAM	-34.30	29.05	-10.26	1.39	V		0.055	17.40
		256QAM	-37.31	26.04	-10.26	1.39	V		0.027	14.39

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
816.5	LTE B26/ 5 MHz	QPSK	-33.08	30.03	-10.28	1.39	V	< 100	0.069	18.36
		16QAM	-33.74	29.37	-10.28	1.39	V		0.059	17.70
		64QAM	-34.87	28.24	-10.28	1.39	V		0.045	16.57
		256QAM	-37.91	25.20	-10.28	1.39	V		0.023	13.53
821.5		QPSK	-32.63	30.67	-10.26	1.39	V		0.080	19.02
		16QAM	-33.20	30.10	-10.26	1.39	V		0.070	18.45
		64QAM	-34.47	28.83	-10.26	1.39	V		0.052	17.18
		256QAM	-37.56	25.74	-10.26	1.39	V		0.026	14.09

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
819.0	LTE B26/ 10 MHz	QPSK	-32.95	30.24	-10.27	1.39	V	< 100	0.072	18.58
		16QAM	-33.64	29.55	-10.27	1.39	V		0.062	17.89
		64QAM	-35.21	27.98	-10.27	1.39	V		0.043	16.32
		256QAM	-38.10	25.09	-10.27	1.39	V		0.022	13.43

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
821.5	LTE B26/ 15 MHz	QPSK	-33.04	30.26	-10.26	1.39	V	< 7.00	0.073	18.61
		16QAM	-33.70	29.60	-10.26	1.39	V		0.062	17.95
		64QAM	-34.82	28.48	-10.26	1.39	V		0.048	16.83
		256QAM	-38.04	25.26	-10.26	1.39	V		0.023	13.61

Note

1. Limit: None (for reporting purposes only)

8.3 RADIATED SPURIOUS EMISSIONS

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 1.4 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26697 (814.7)	1,629.40	-53.35	9.40	-62.78	1.98	V	-55.36	-13.00
	2,444.10	-56.65	10.47	-60.38	2.47	V	-52.38	-13.00
	3,258.80	-57.10	12.00	-57.75	2.88	V	-48.63	-13.00
26783 (823.3)	1,646.60	-53.65	9.48	-63.33	1.99	V	-55.84	-13.00
	2,469.90	-52.32	10.60	-56.45	2.47	V	-48.32	-13.00
	3,293.20	-58.03	12.20	-59.15	2.88	V	-49.83	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26705 (815.5)	1,631.00	-54.10	9.40	-63.53	1.98	H	-56.11	-13.00
	2,446.50	-55.46	10.47	-59.20	2.46	V	-51.19	-13.00
	3,262.00	-57.76	12.00	-58.41	2.88	V	-49.29	-13.00
26775 (822.5)	1,645.00	-53.56	9.48	-63.25	1.98	H	-55.75	-13.00
	2,467.50	-51.96	10.60	-56.09	2.47	V	-47.96	-13.00
	3,290.00	-57.34	12.20	-58.46	2.88	V	-49.14	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26715 (816.5)	1,633.00	-53.87	9.40	-63.30	1.98	H	-55.88	-13.00
	2,449.50	-55.84	10.53	-59.59	2.46	V	-51.52	-13.00
	3,266.00	-58.13	12.05	-58.98	2.88	H	-49.81	-13.00
26765 (821.5)	1,643.00	-52.64	9.45	-62.39	1.98	H	-54.92	-13.00
	2,464.50	-55.07	10.58	-59.21	2.46	V	-51.09	-13.00
	3,286.00	-57.81	12.15	-58.95	2.88	V	-49.68	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26740 (819.0)	1638.00	-52.96	9.45	-62.71	1.98	V	-55.24	-13.00
	2457.00	-55.62	10.55	-59.75	2.46	H	-51.66	-13.00
	3276.00	-58.35	12.10	-59.46	2.88	H	-50.24	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26765 (821.5)	1643.00	-53.37	9.45	-63.12	1.98	H	-55.65	-13.00
	2464.50	-54.89	10.58	-59.03	2.46	H	-50.91	-13.00
	3286.00	-57.86	12.15	-59.00	2.88	V	-49.73	-13.00

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 26	1.4 MHz	823.3	QPSK	6	0	1.0945
			16QAM			1.0857
			64QAM			1.0947
			256QAM			1.0870
	3 MHz	822.5	QPSK	15		2.7063
			16QAM			2.7078
			64QAM			2.7043
			256QAM			2.7069
	5 MHz	821.5	QPSK	25		4.4898
			16QAM			4.5163
			64QAM			4.4994
			256QAM			4.5331
	10 MHz	819.0	QPSK	50		8.9518
			16QAM			8.9899
			64QAM			8.9805
			256QAM			8.9839
	15 MHz	821.5	QPSK	75		13.460
			16QAM			13.459
			64QAM			13.447
			256QAM			13.460

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 46 ~ 65.

8.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
26	1.4	814.7	3.7194	27.976	-67.371	-39.395	-13.00
		823.3	3.7034	27.976	-67.195	-39.219	
	3	815.5	3.6875	27.976	-67.229	-39.253	
		822.5	3.6870	27.976	-66.772	-38.796	
	5	816.5	3.6745	27.976	-67.226	-39.250	
		821.5	3.7049	27.976	-67.256	-39.280	
	10	819.0	3.1606	27.976	-67.245	-39.269	
	15	821.5	3.6765	27.976	-67.141	-39.165	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 86 ~ 93.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20	30.131

8.6 CHANNEL EDGE

- Plots of the EUT's Band Edge are shown Page 66 ~ 85.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 26

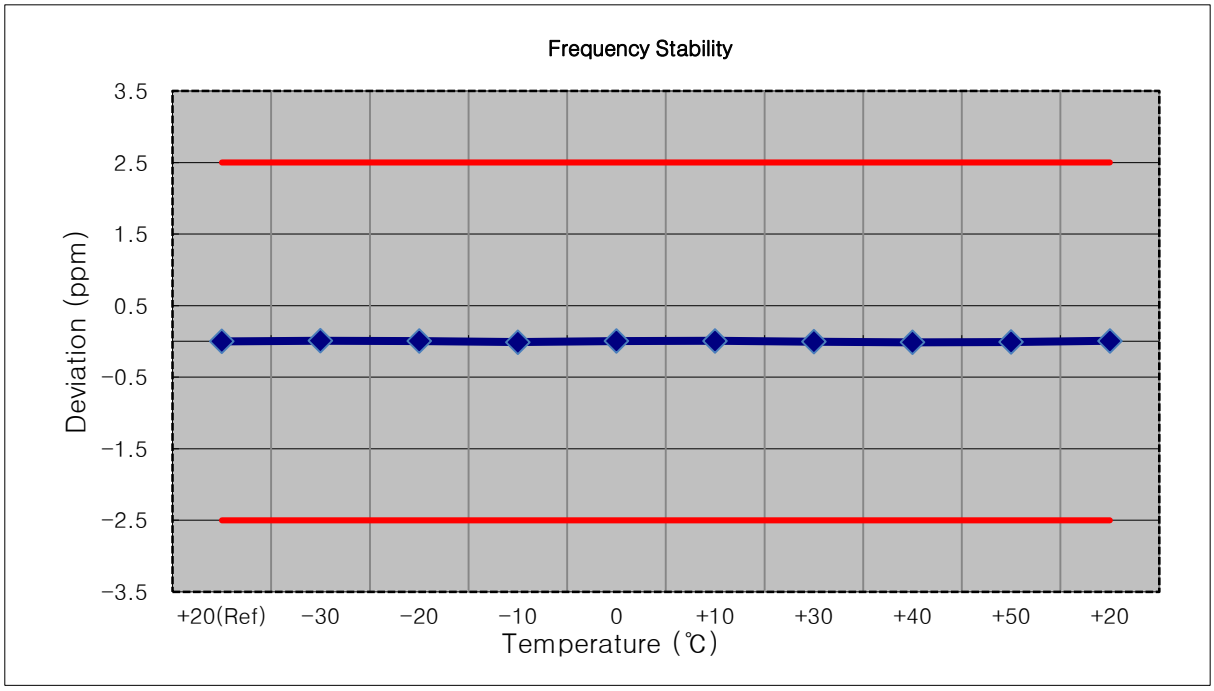
▣ OPERATING FREQUENCY: 814,700,000 Hz

▣ CHANNEL: 26697(1.4MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.880	+20(Ref)	814 699 994	0.0	0.000 000	0.000
100%		-30	814 700 002	8.0	0.000 001	0.010
100%		-20	814 699 999	4.8	0.000 001	0.006
100%		-10	814 699 986	-7.9	-0.000 001	-0.010
100%		0	814 699 998	4.2	0.000 001	0.005
100%		+10	814 700 000	6.1	0.000 001	0.007
100%		+30	814 699 991	-2.6	0.000 000	-0.003
100%		+40	814 699 984	-9.4	-0.000 001	-0.012
100%		+50	814 699 987	-7.0	-0.000 001	-0.009
Batt. Endpoint	3.650	+20	814 700 000	6.0	0.000 001	0.007



▣ MODE: LTE 26

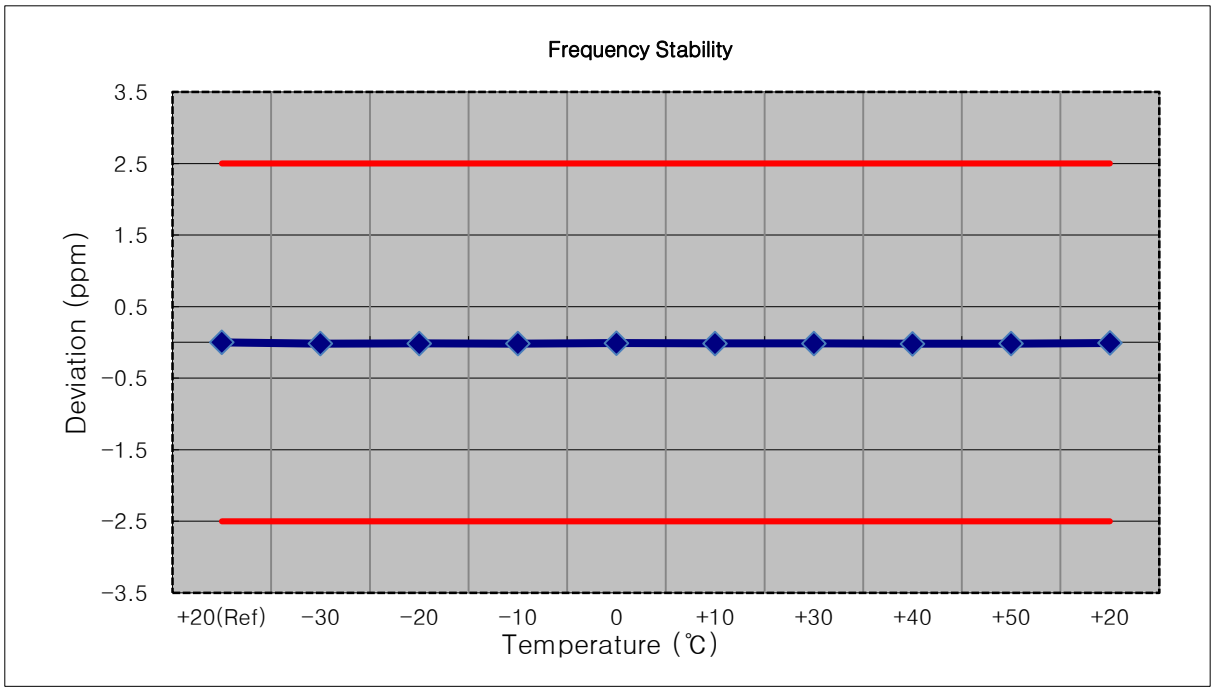
▣ OPERATING FREQUENCY: 815,500,000 Hz

▣ CHANNEL: 26705(3MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.880	+20(Ref)	815 499 991	0.0	0.000 000	0.000
100%		-30	815 499 977	-14.0	-0.000 002	-0.017
100%		-20	815 499 978	-12.9	-0.000 002	-0.016
100%		-10	815 499 977	-13.6	-0.000 002	-0.017
100%		0	815 499 982	-8.5	-0.000 001	-0.010
100%		+10	815 499 979	-12.2	-0.000 001	-0.015
100%		+30	815 499 979	-11.9	-0.000 001	-0.015
100%		+40	815 499 975	-16.1	-0.000 002	-0.020
100%		+50	815 499 978	-13.2	-0.000 002	-0.016
Batt. Endpoint	3.650	+20	815 499 985	-5.9	-0.000 001	-0.007



▣ MODE: LTE 26

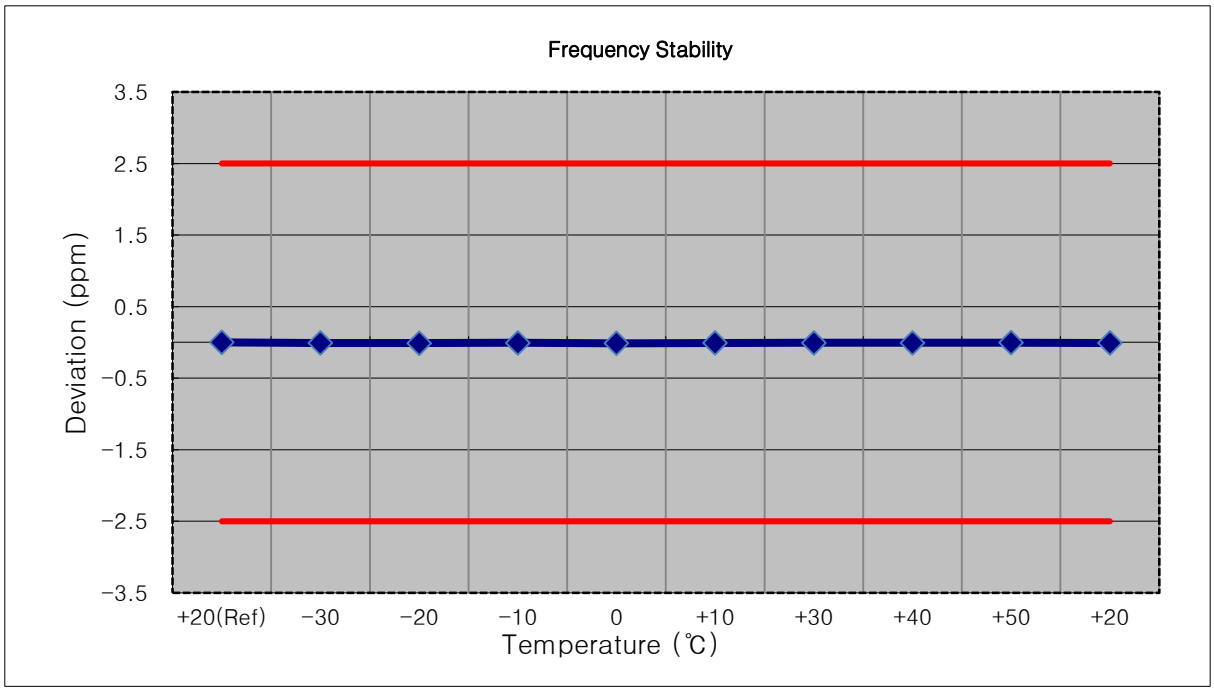
▣ OPERATING FREQUENCY: 816,500,000 Hz

▣ CHANNEL: 26715(5MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.880	+20(Ref)	816 500 003	0.0	0.000 000	0.000
100%		-30	816 499 996	-6.8	-0.000 001	-0.008
100%		-20	816 499 994	-8.8	-0.000 001	-0.011
100%		-10	816 499 998	-5.5	-0.000 001	-0.007
100%		0	816 499 993	-9.8	-0.000 001	-0.012
100%		+10	816 499 997	-5.8	-0.000 001	-0.007
100%		+30	816 499 998	-5.1	-0.000 001	-0.006
100%		+40	816 499 999	-4.5	-0.000 001	-0.006
100%		+50	816 500 000	-3.0	0.000 000	-0.004
Batt. Endpoint	3.650	+20	816 499 996	-6.9	-0.000 001	-0.008



▣ MODE: LTE 26

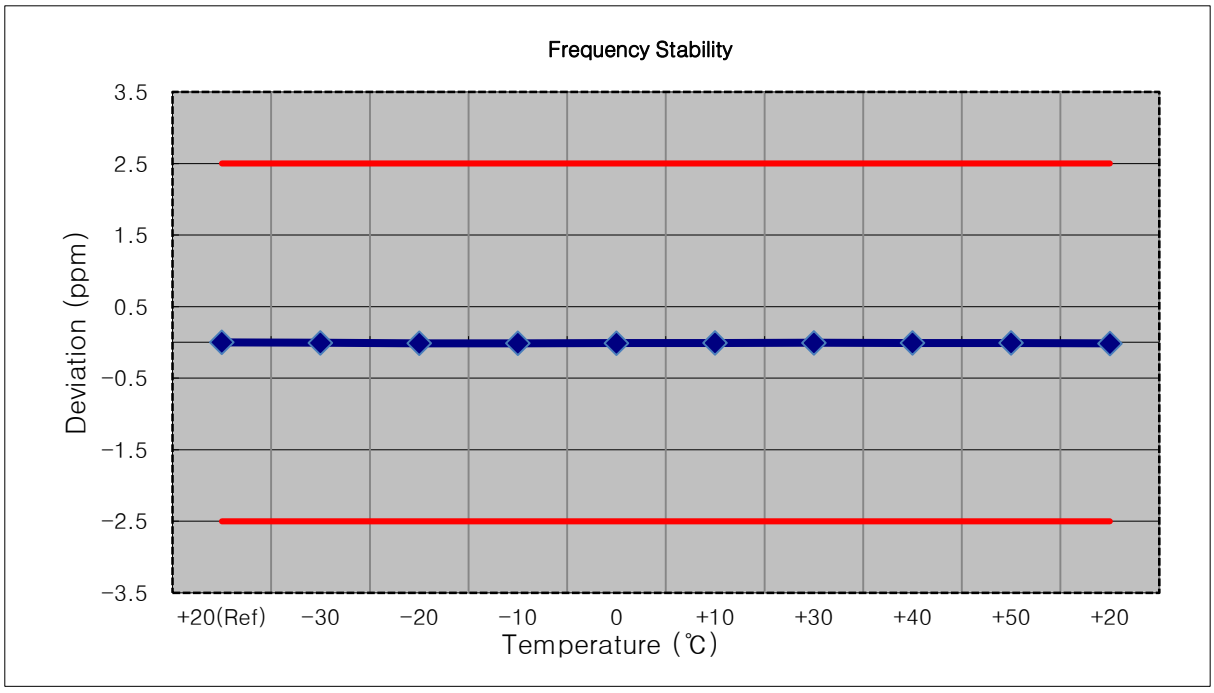
▣ OPERATING FREQUENCY: 819,000,000 Hz

▣ CHANNEL: 26740(10 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.880	+20(Ref)	818 999 994	0.0	0.000 000	0.000
100%		-30	818 999 989	-4.3	-0.000 001	-0.005
100%		-20	818 999 983	-10.4	-0.000 001	-0.013
100%		-10	818 999 983	-10.5	-0.000 001	-0.013
100%		0	818 999 986	-8.0	-0.000 001	-0.010
100%		+10	818 999 987	-6.3	-0.000 001	-0.008
100%		+30	818 999 989	-5.1	-0.000 001	-0.006
100%		+40	818 999 987	-7.1	-0.000 001	-0.009
100%		+50	818 999 987	-6.5	-0.000 001	-0.008
Batt. Endpoint	3.650	+20	818 999 982	-12.2	-0.000 001	-0.015



▣ MODE: LTE 26

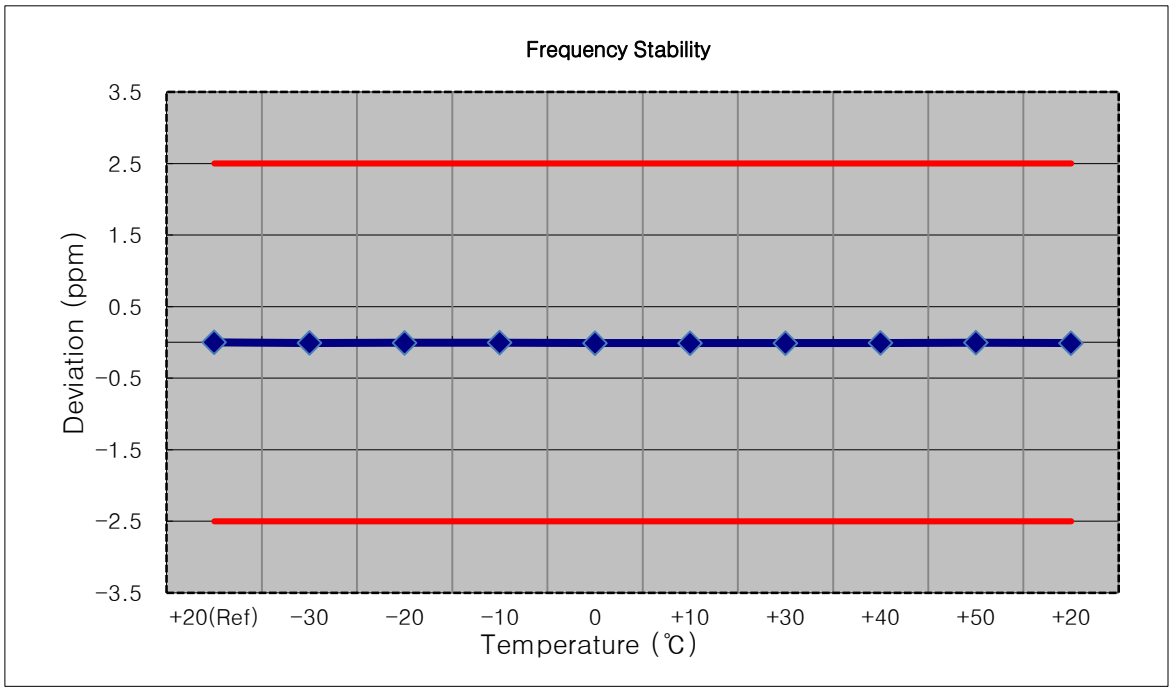
▣ OPERATING FREQUENCY: 821,500,000 Hz

▣ CHANNEL: 26765(15 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.880	+20(Ref)	821 499 992	0.0	0.000 000	0.000
100%		-30	821 499 985	-7.3	-0.000 001	-0.009
100%		-20	821 499 987	-5.4	-0.000 001	-0.007
100%		-10	821 499 990	-2.5	0.000 000	-0.003
100%		0	821 499 983	-9.1	-0.000 001	-0.011
100%		+10	821 499 984	-8.2	-0.000 001	-0.010
100%		+30	821 499 985	-7.4	-0.000 001	-0.009
100%		+40	821 499 987	-5.6	-0.000 001	-0.007
100%		+50	821 499 989	-3.6	0.000 000	-0.004
Batt. Endpoint	3.650	+20	821 499 983	-9.2	-0.000 001	-0.011



8.8 STADDLE CHANNEL

8.8.1 EFFECTIVE RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 1.4 MHz	QPSK	-32.46	30.94	-10.25	1.39	H	< 7.00	0.085	19.30
		16QAM	-32.85	30.55	-10.25	1.39	H		0.078	18.91
		64QAM	-34.25	29.15	-10.25	1.39	V		0.056	17.51
		256QAM	-37.20	26.20	-10.25	1.39	V		0.029	14.56

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 3 MHz	QPSK	-32.38	31.02	-10.25	1.39	H	< 7.00	0.087	19.38
		16QAM	-32.97	30.43	-10.25	1.39	H		0.076	18.79
		64QAM	-34.22	29.18	-10.25	1.39	V		0.057	17.54
		256QAM	-37.27	26.13	-10.25	1.39	V		0.028	14.49

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 5 MHz	QPSK	-32.58	30.82	-10.25	1.39	H	< 7.00	0.083	19.18
		16QAM	-33.14	30.26	-10.25	1.39	H		0.073	18.62
		64QAM	-34.35	29.05	-10.25	1.39	V		0.055	17.41
		256QAM	-37.46	25.94	-10.25	1.39	V		0.027	14.30

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 10 MHz	QPSK	-32.60	30.80	-10.25	1.39	H	< 7.00	0.082	19.16
		16QAM	-33.20	30.20	-10.25	1.39	H		0.072	18.56
		64QAM	-34.52	28.88	-10.25	1.39	V		0.053	17.24
		256QAM	-37.90	25.50	-10.25	1.39	V		0.024	13.86

8.8.2 RADIATED SPURIOUS EMISSIONS

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 1.4 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26790 (824.0)	1,648.00	-53.22	9.50	-62.83	1.99	V	-55.32	-13.00
	2,472.00	-53.35	10.60	-57.48	2.47	V	-49.35	-13.00
	3,296.00	-58.10	12.25	-59.18	2.89	V	-49.82	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26790 (824.0)	1,648.00	-53.25	9.50	-62.86	1.99	H	-55.35	-13.00
	2,472.00	-55.61	10.60	-59.74	2.47	V	-51.61	-13.00
	3,296.00	-57.97	12.25	-59.05	2.89	H	-49.69	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26790 (824.0)	1,648.00	-52.82	9.50	-62.43	1.99	V	-54.92	-13.00
	2,472.00	-55.23	10.60	-59.36	2.47	V	-51.23	-13.00
	3,296.00	-57.31	12.25	-58.39	2.89	V	-49.03	-13.00

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26790 (824.0)	1,648.00	-52.82	9.50	-62.43	1.99	H	-54.92	-13.00
	2,472.00	-52.37	10.60	-56.50	2.47	V	-48.37	-13.00
	3,296.00	-57.69	12.25	-58.77	2.89	V	-49.41	-13.00

8.8.3 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
26	1.4	824.0	3.6910	27.976	-66.979	-39.003	-13.00
	3		3.7084	27.976	-67.183	-39.207	
	5		3.7184	27.976	-67.282	-39.306	
	10		3.1541	27.976	-67.563	-39.587	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 95 ~ 98.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20	30.131

8.8.4 CHANNEL EDGE(Part90)

- Test Channel : 26790(824.0MHz)

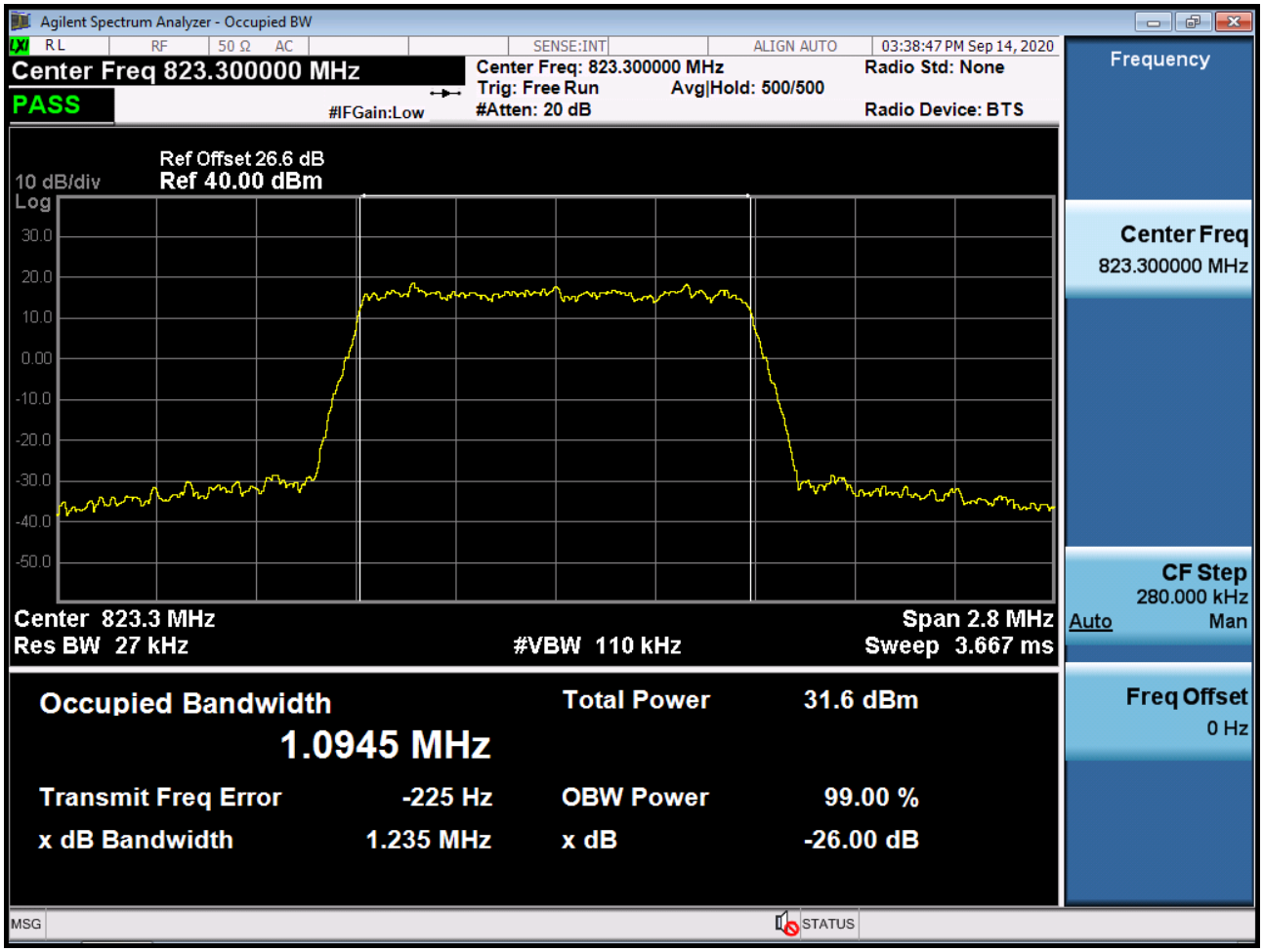
Plots of the EUT's Band Edge are shown Page 99 ~ 110.

8.8.5 BAND EDGE(Part22)

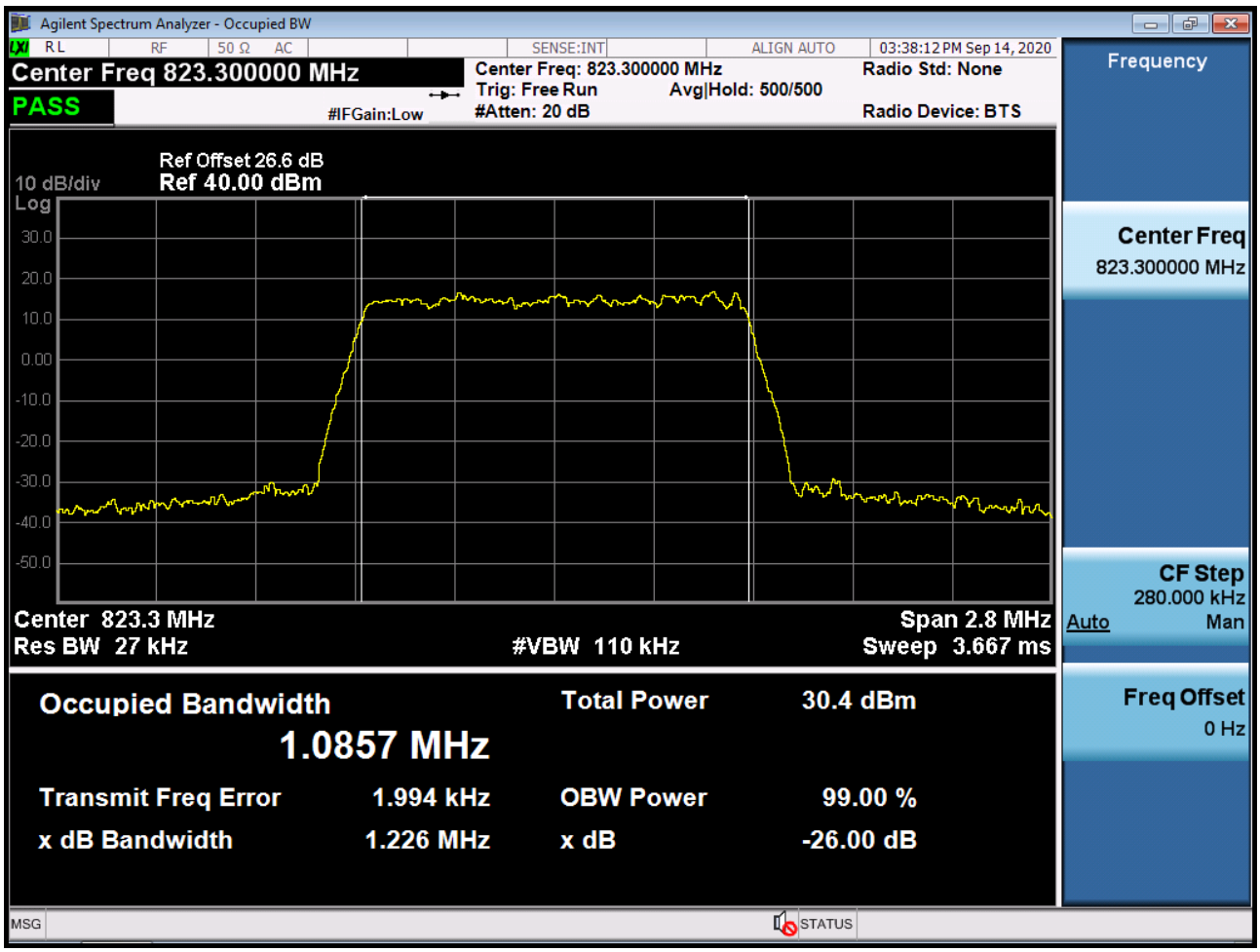
- Test Channel : 26790(824.0MHz)
- Plots of the EUT's Band Edge are shown Page 111 ~ 118.

9. TEST PLOTS

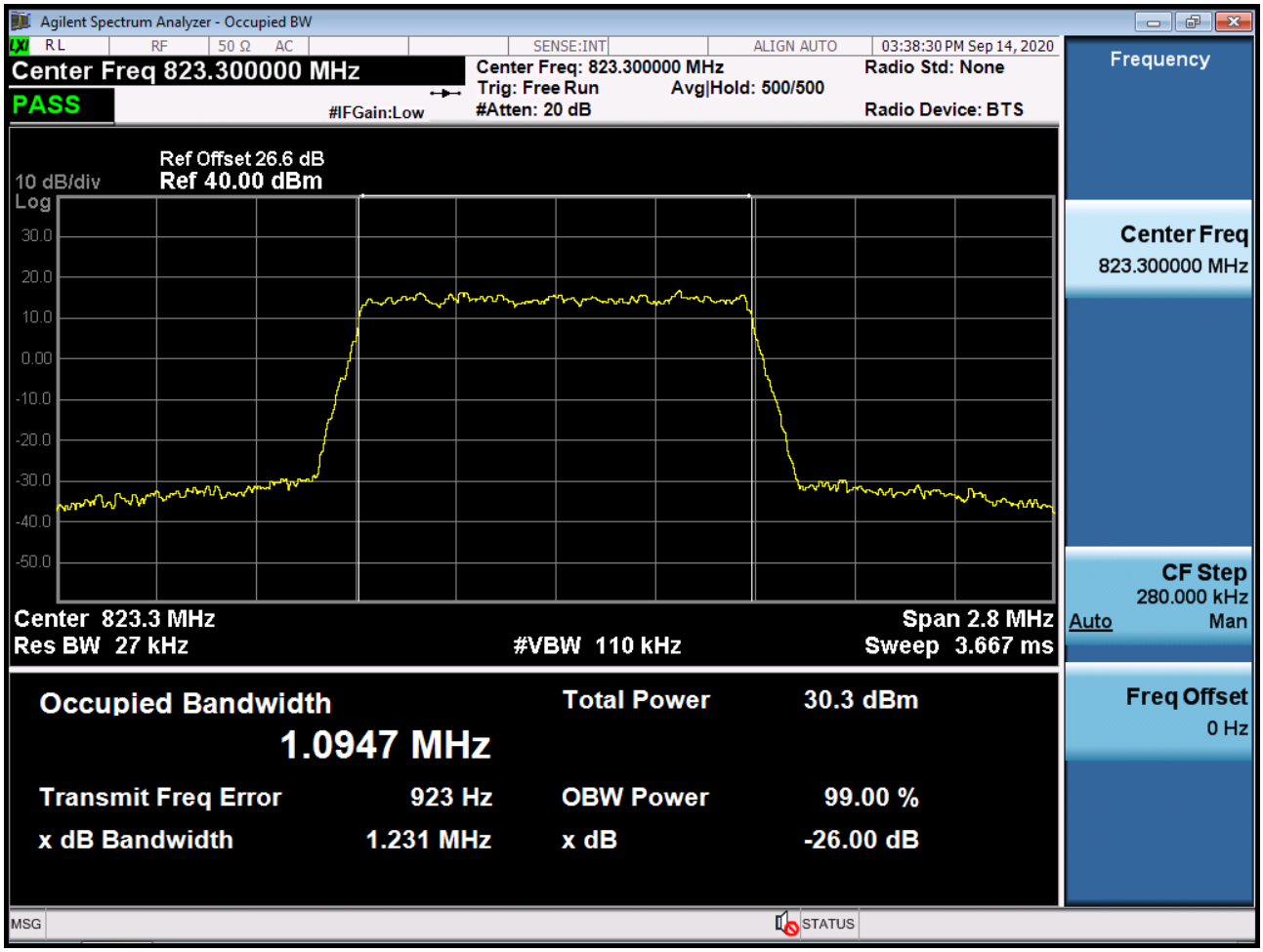
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 QPSK RB 6_0)



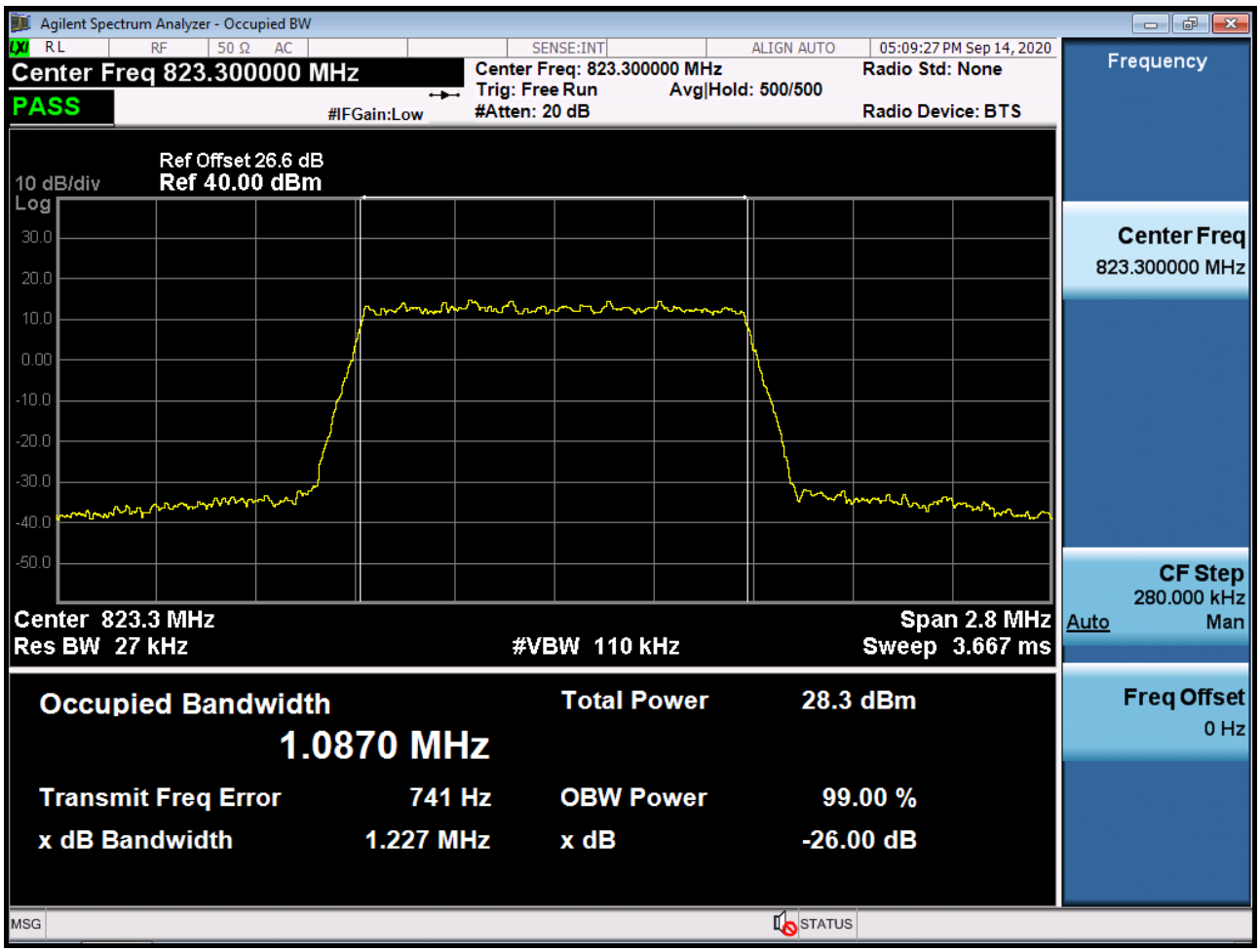
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 16QAM RB 6_0)



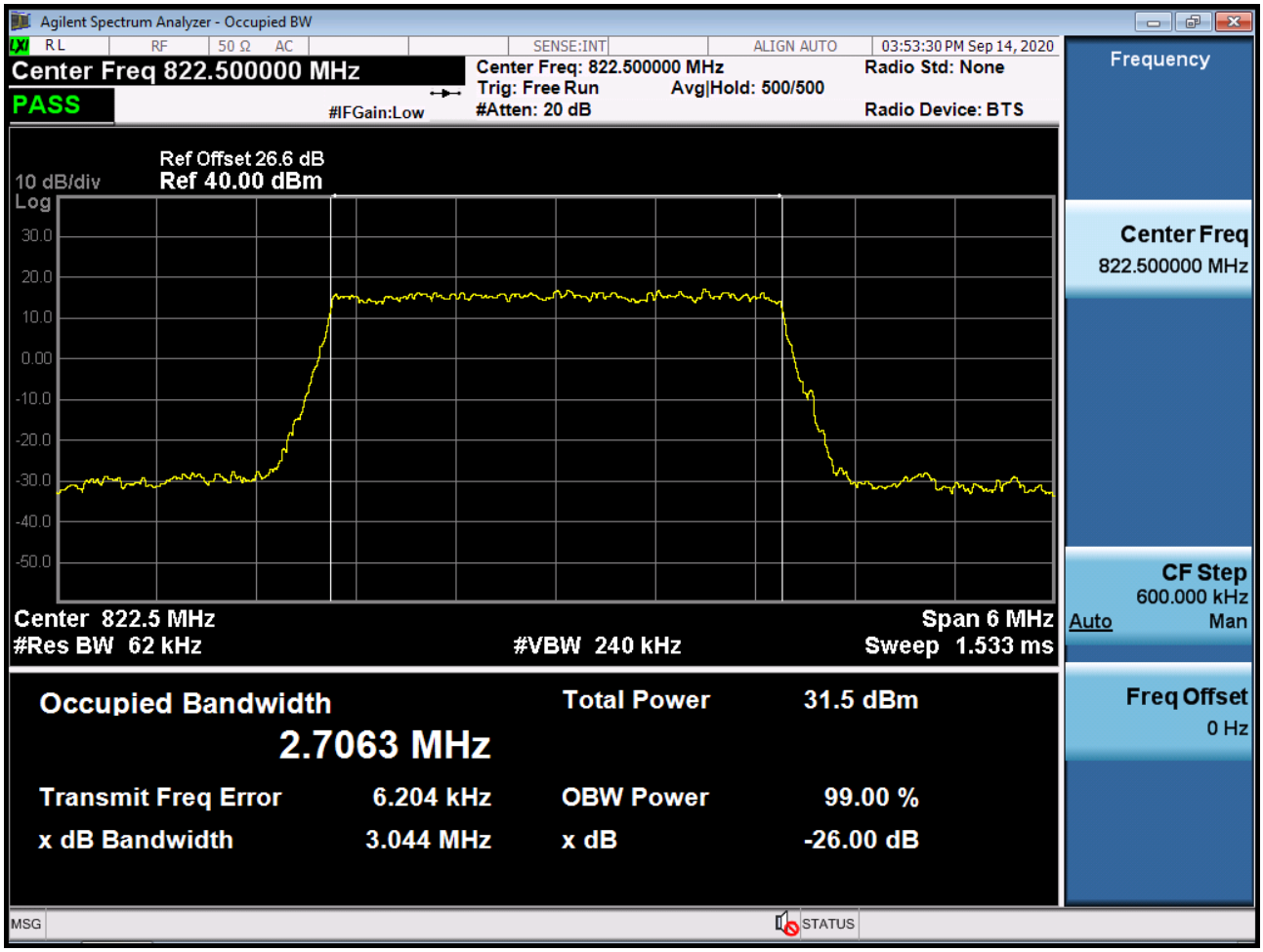
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 64QAM RB 6_0)



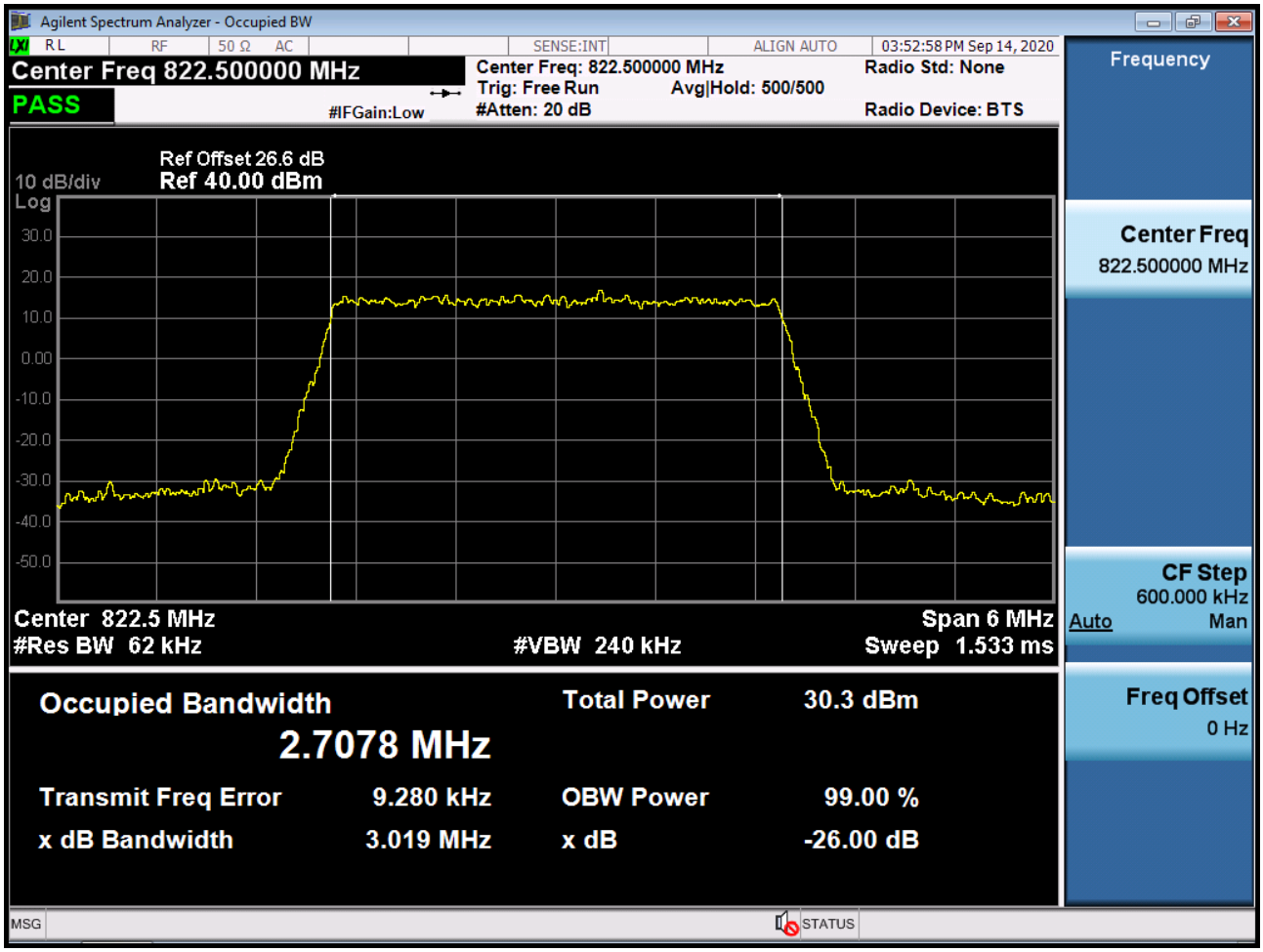
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 256QAM RB 6_0)



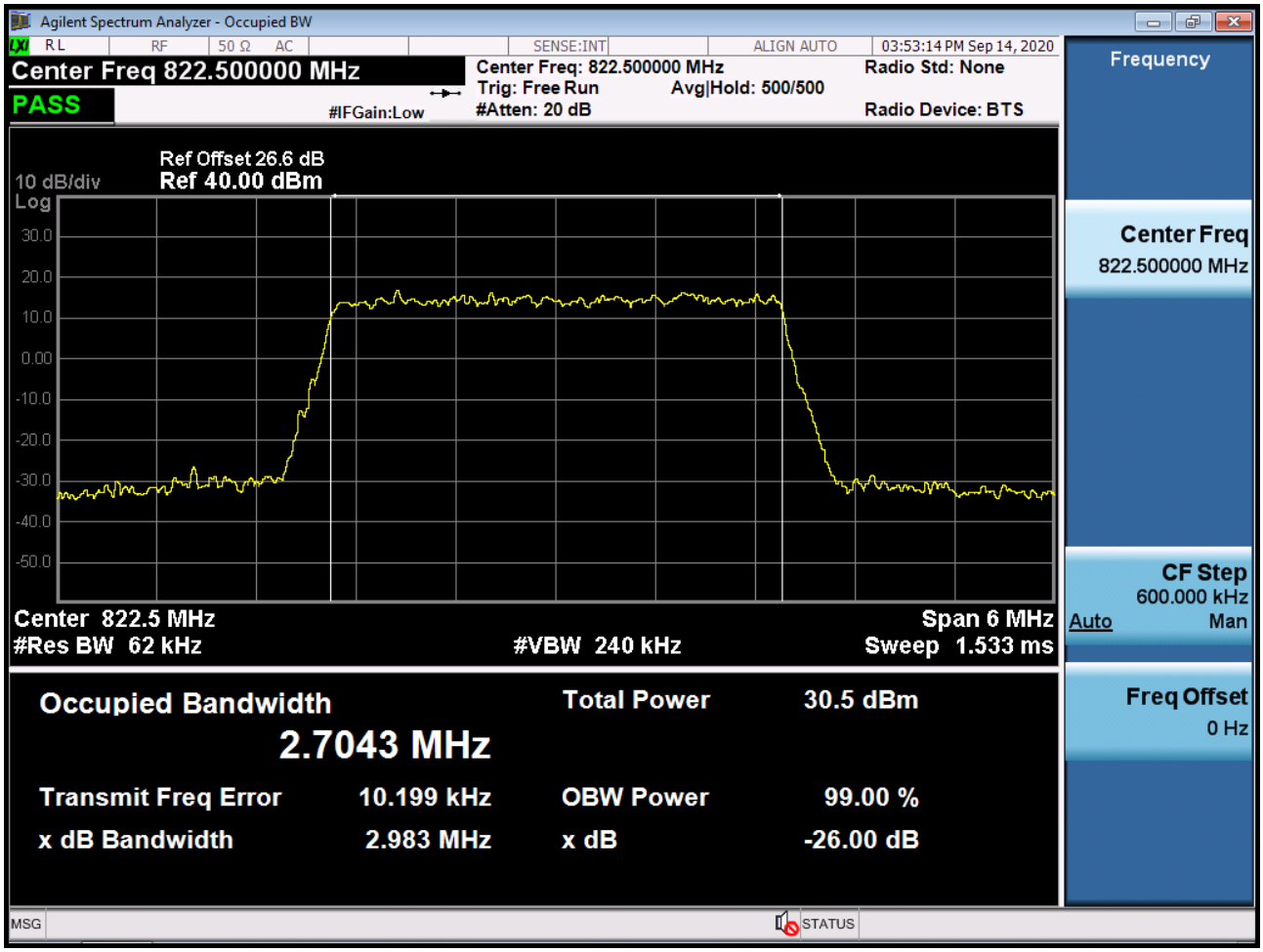
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 QPSK RB 15_0)



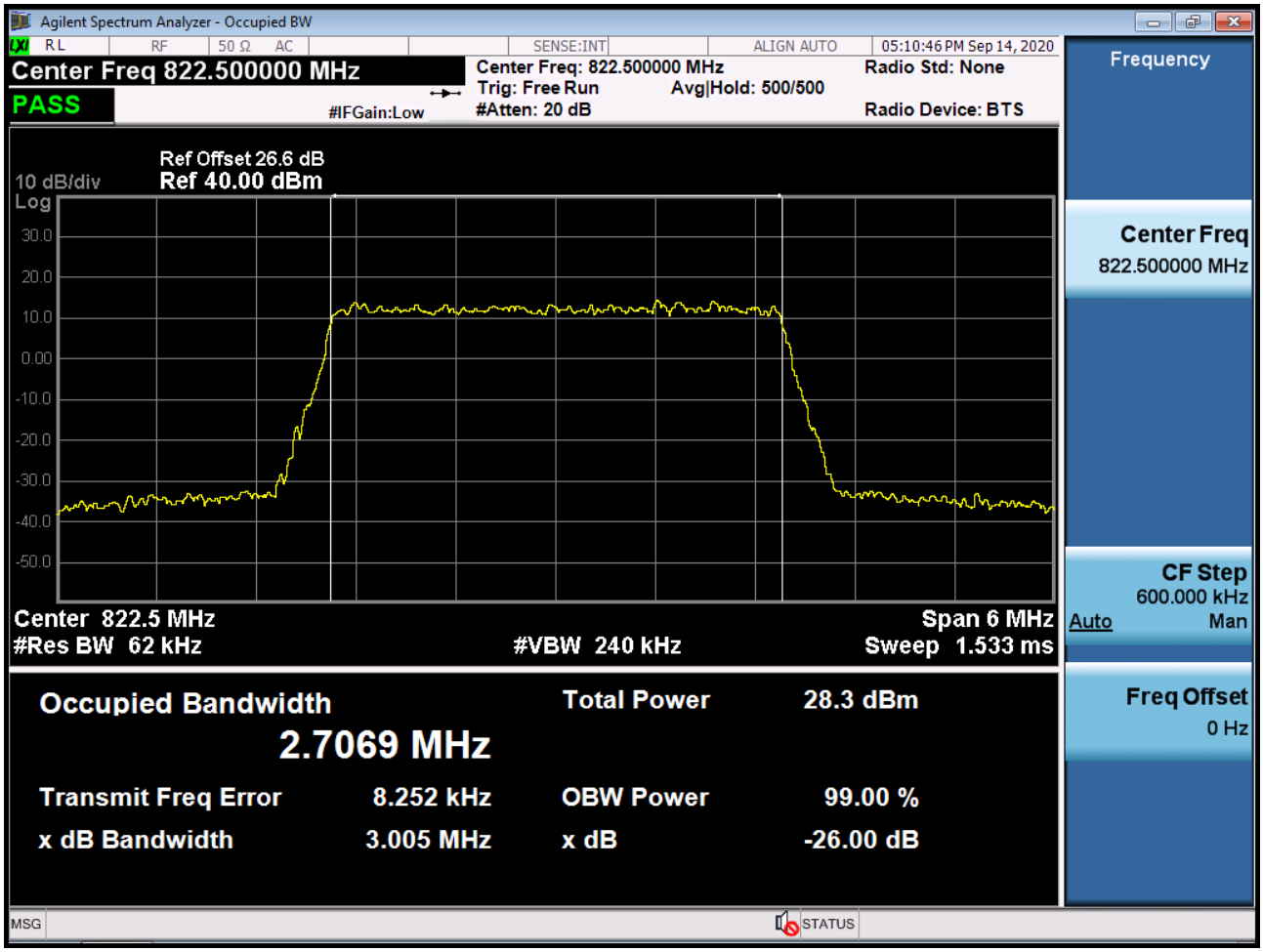
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 16QAM RB 15_0)



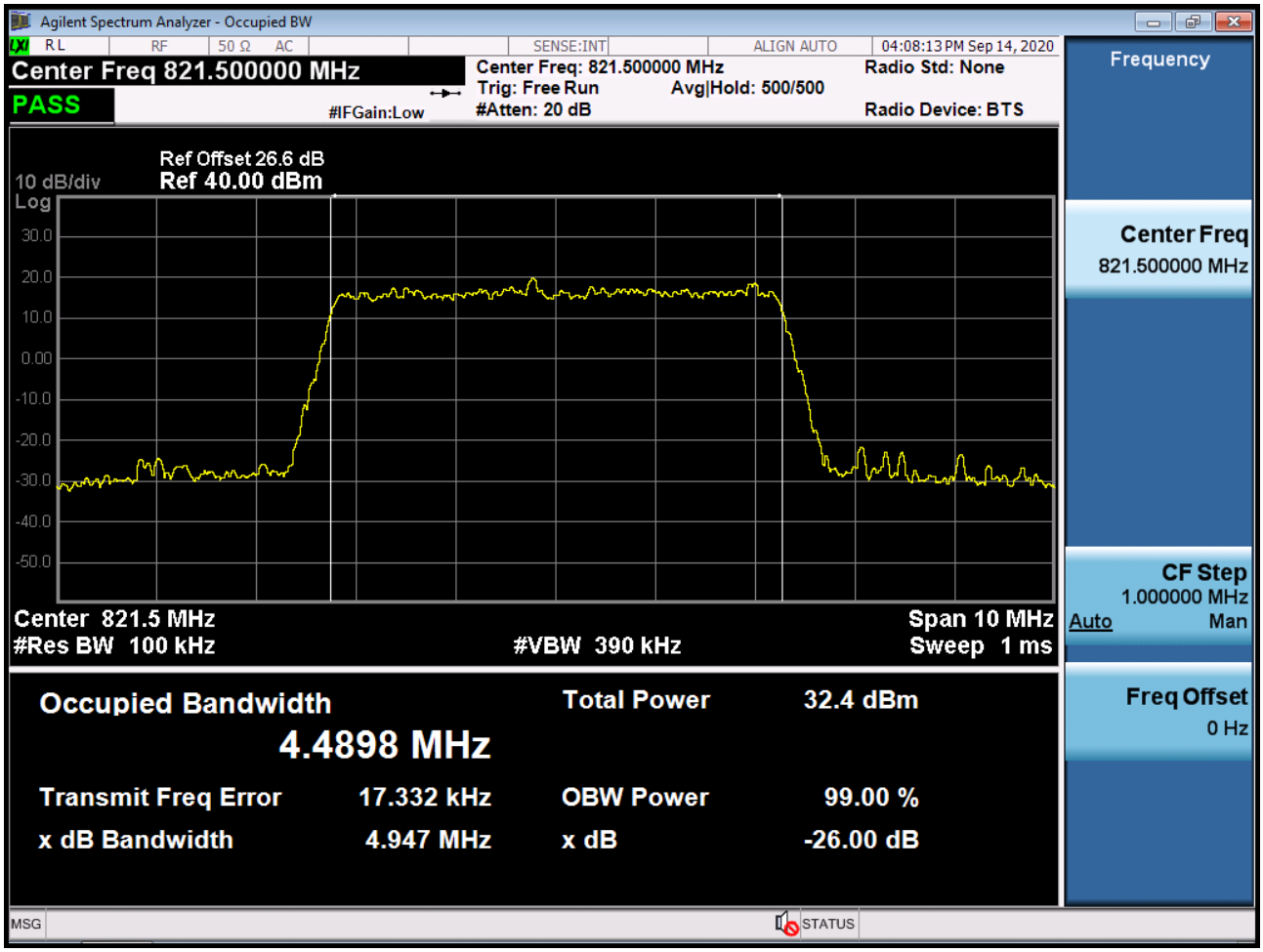
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 64QAM RB 15_0)



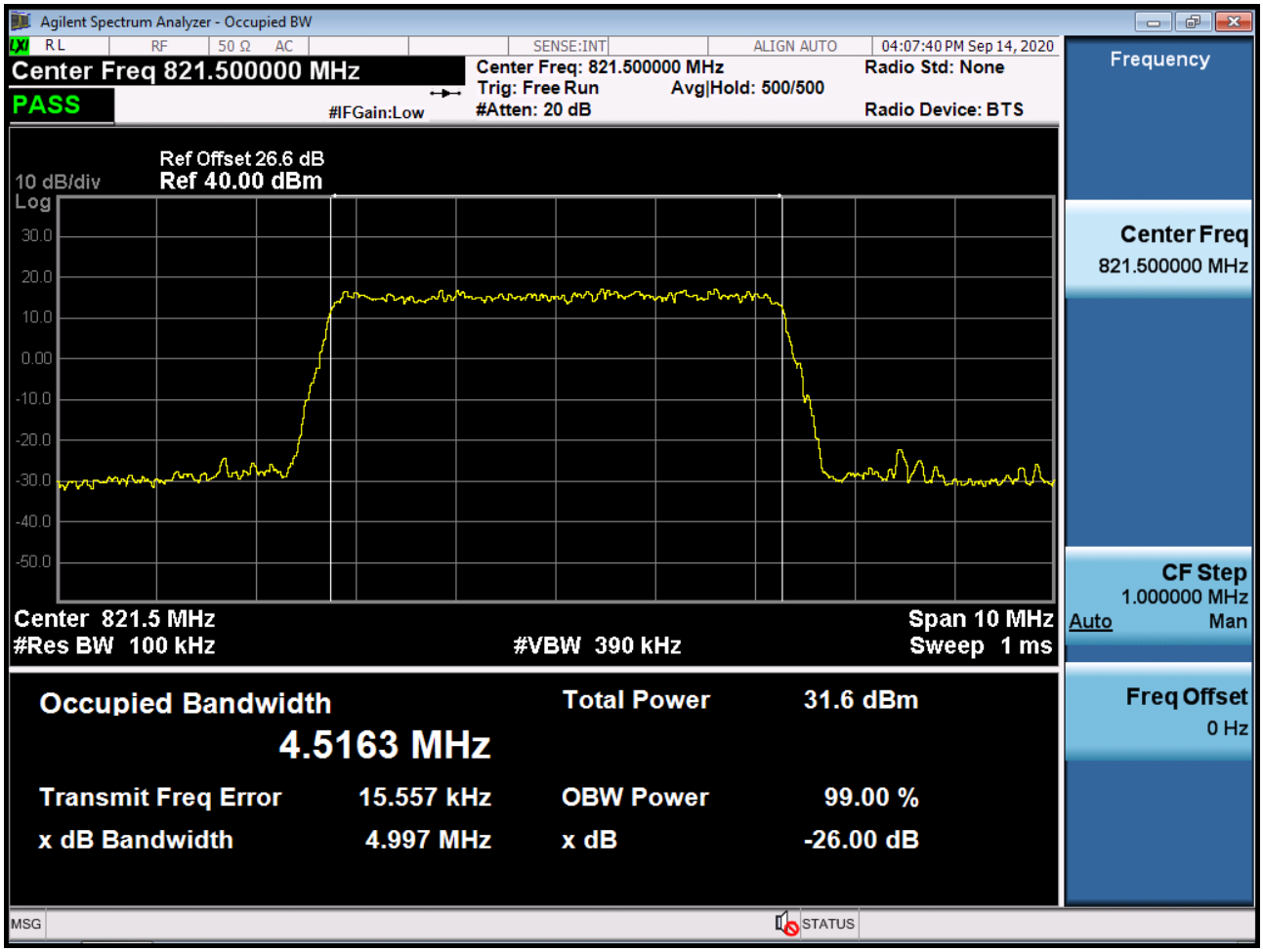
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 256QAM RB 15_0)



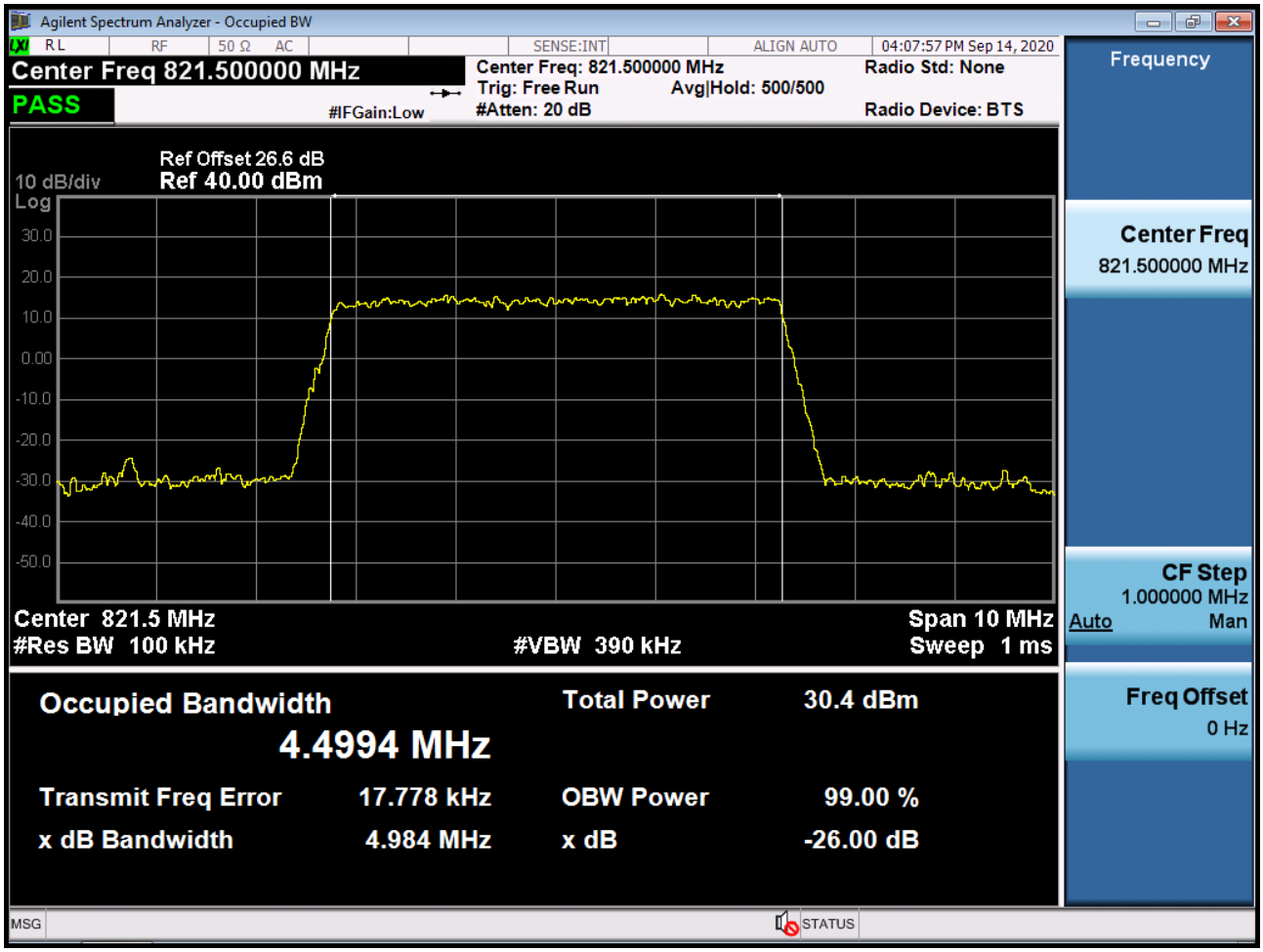
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 QPSK RB 25_0)



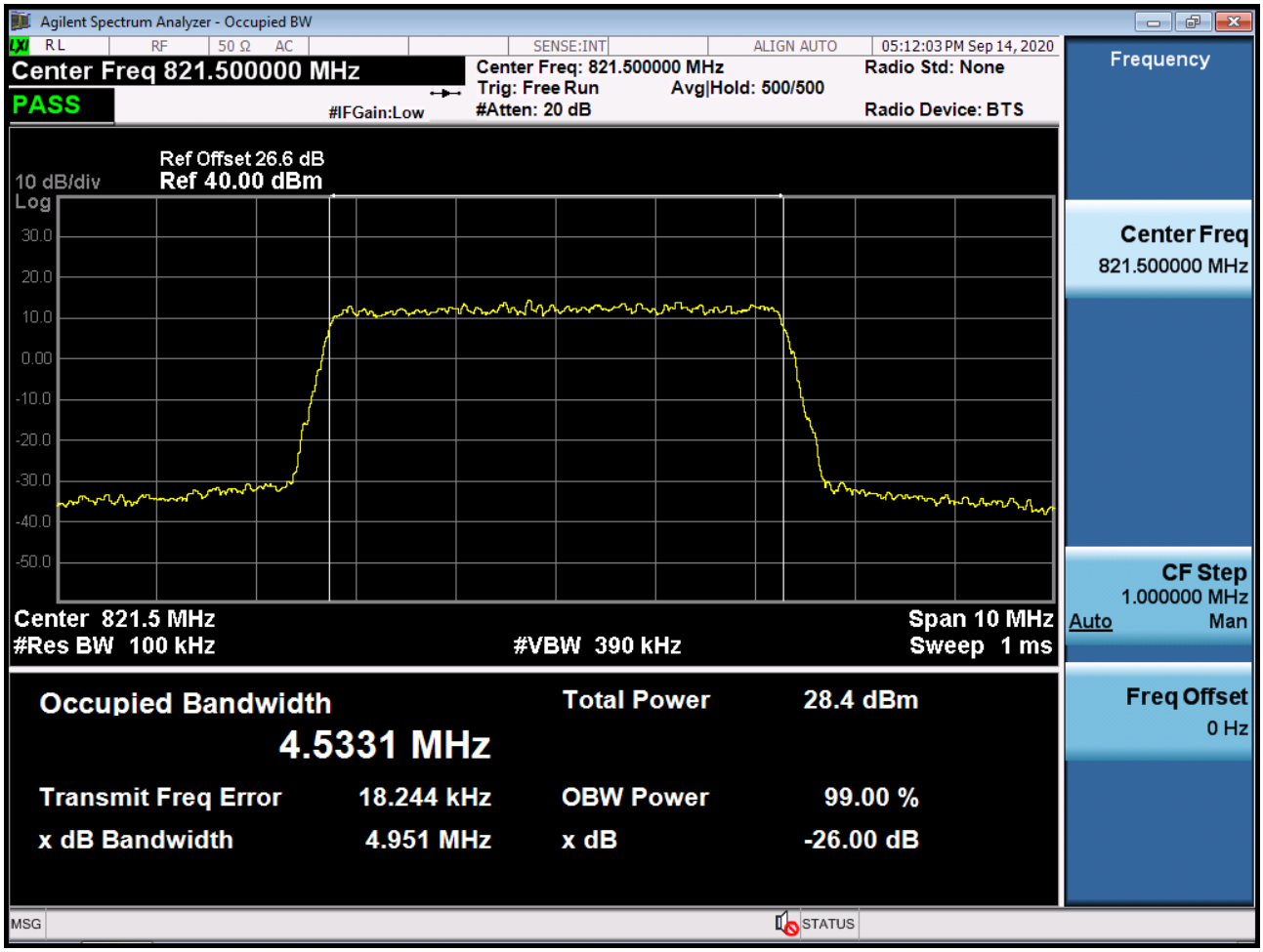
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 16QAM RB 25_0)



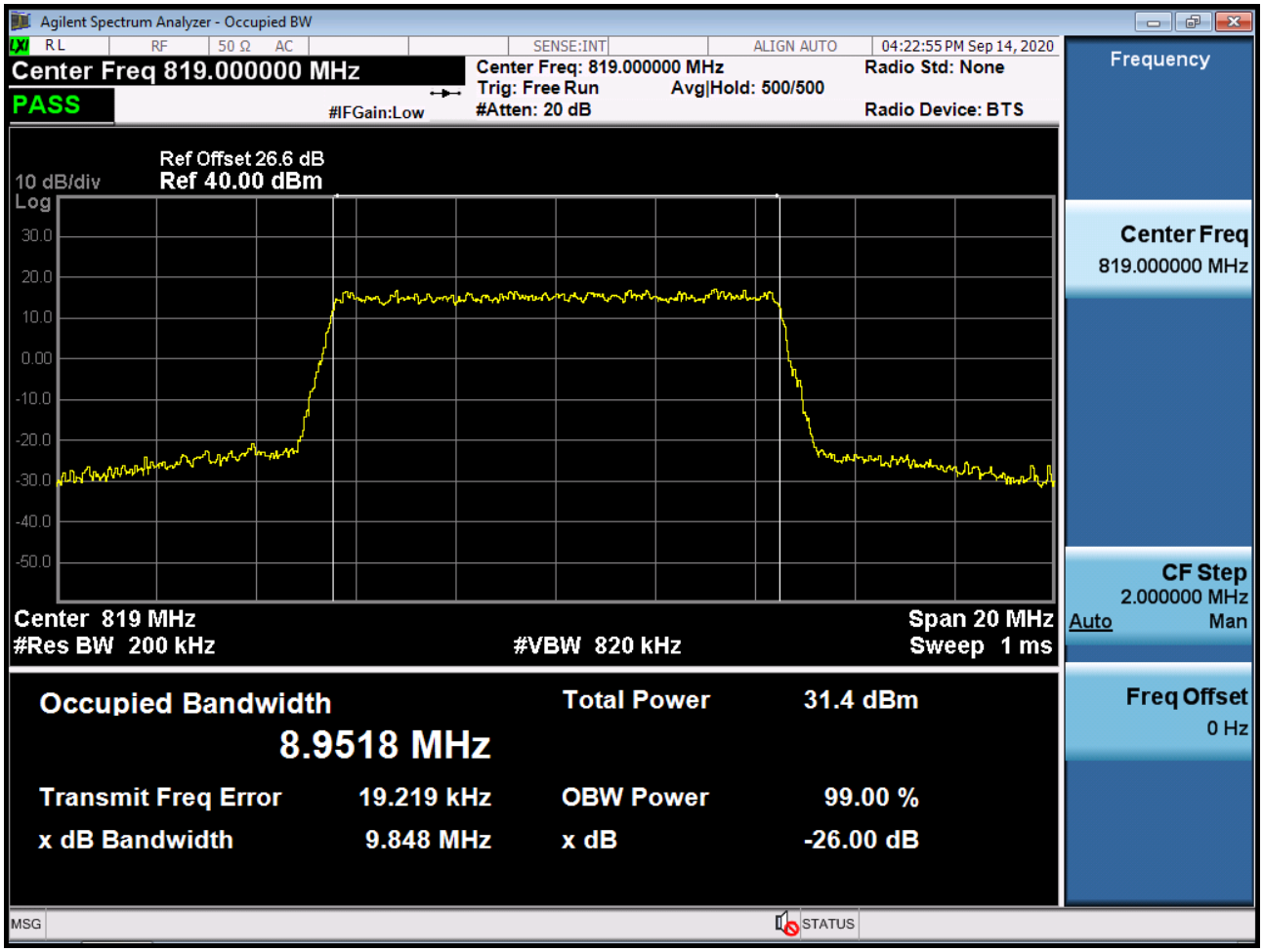
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 64QAM RB 25_0)



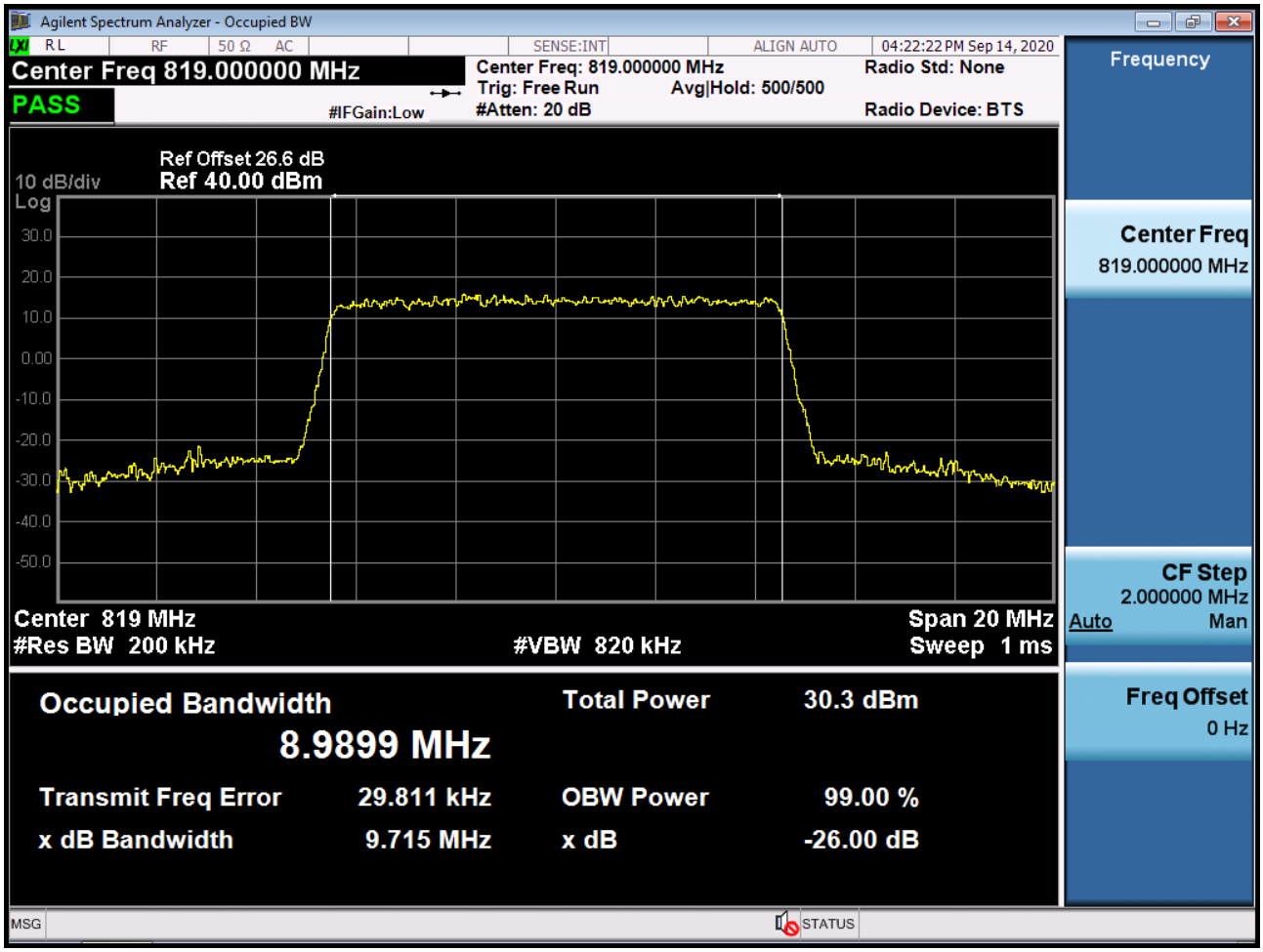
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 256QAM RB 25_0)



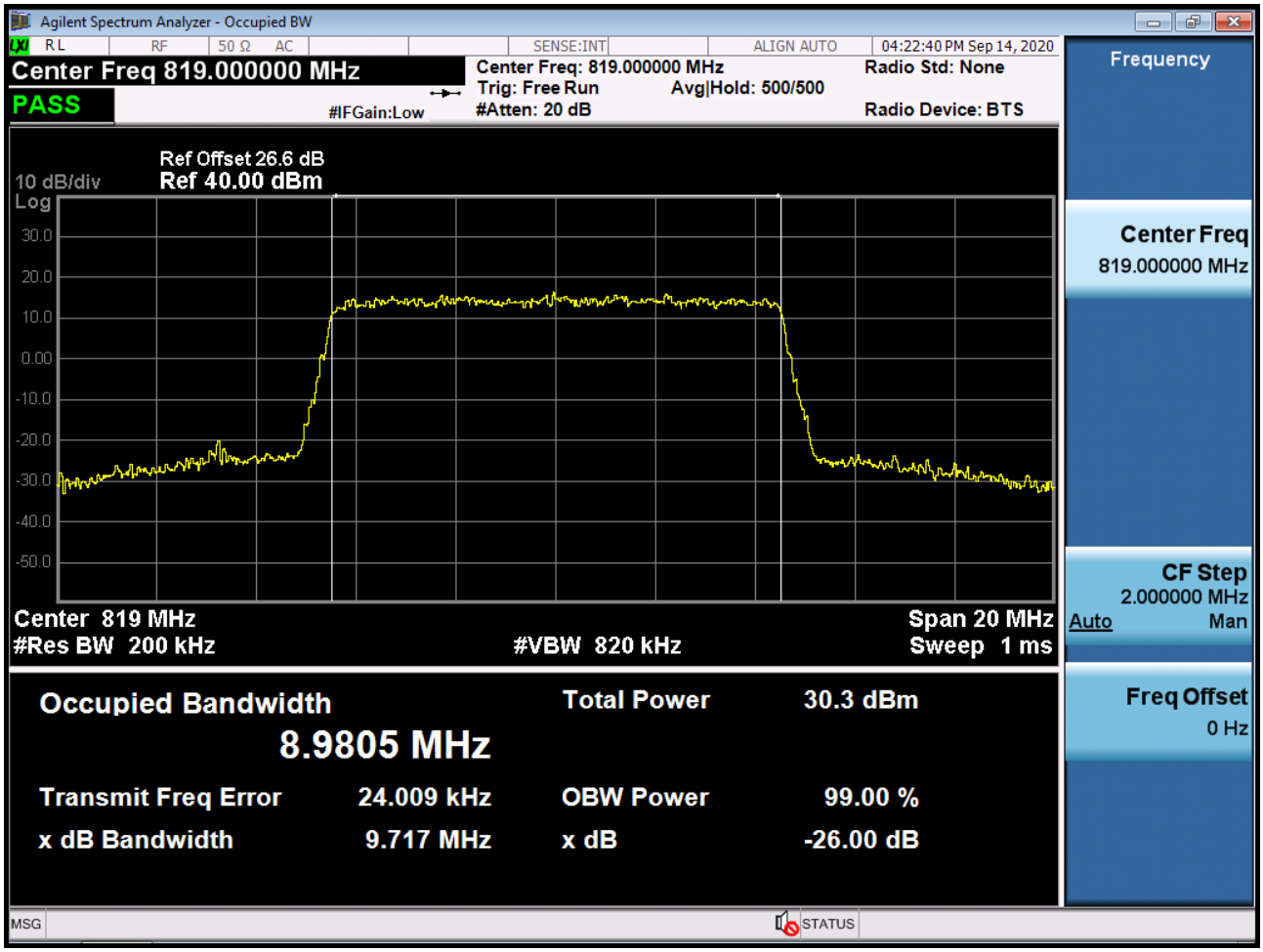
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 QPSK RB 50_0)



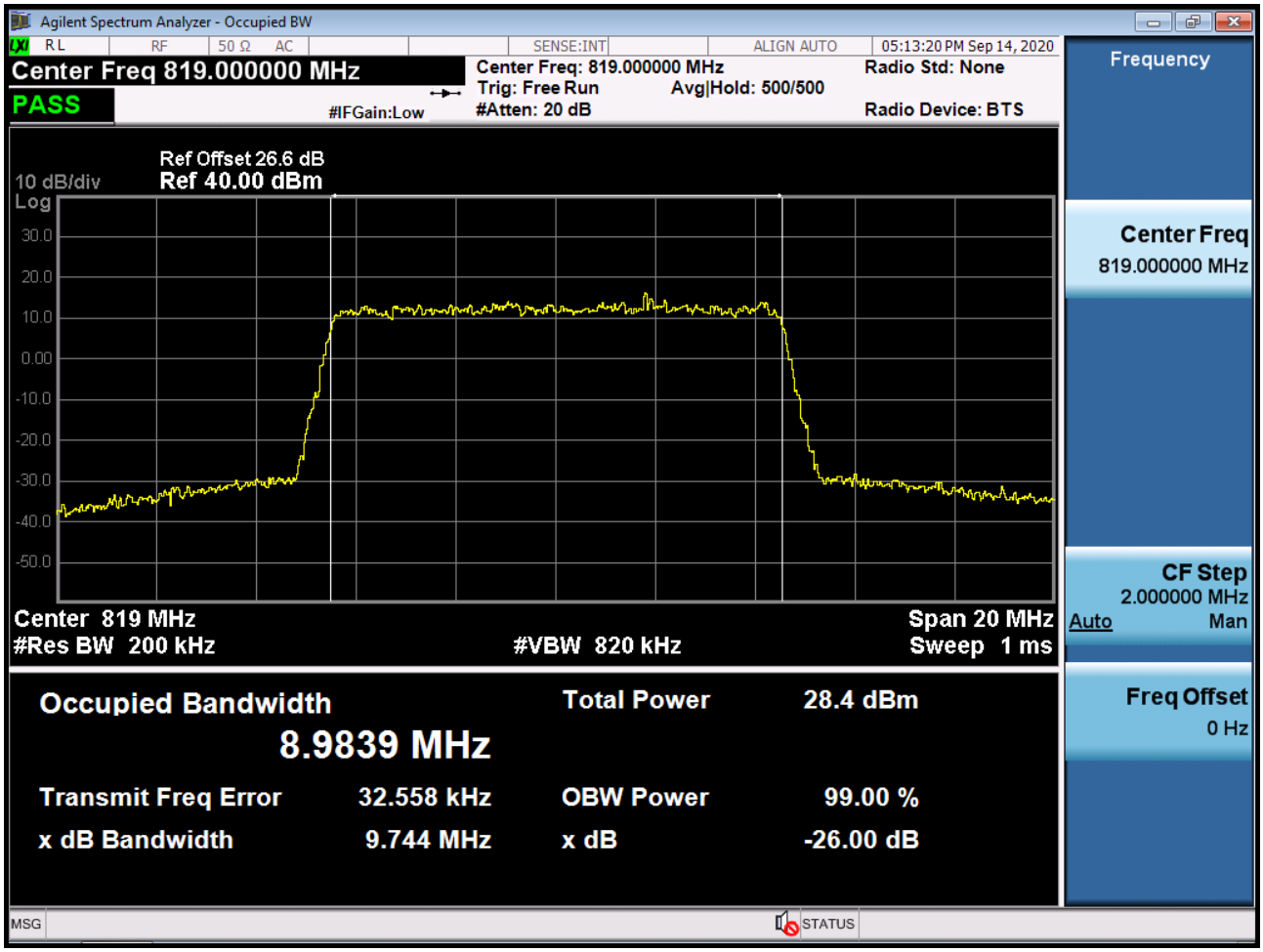
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 16QAM RB 50_0)



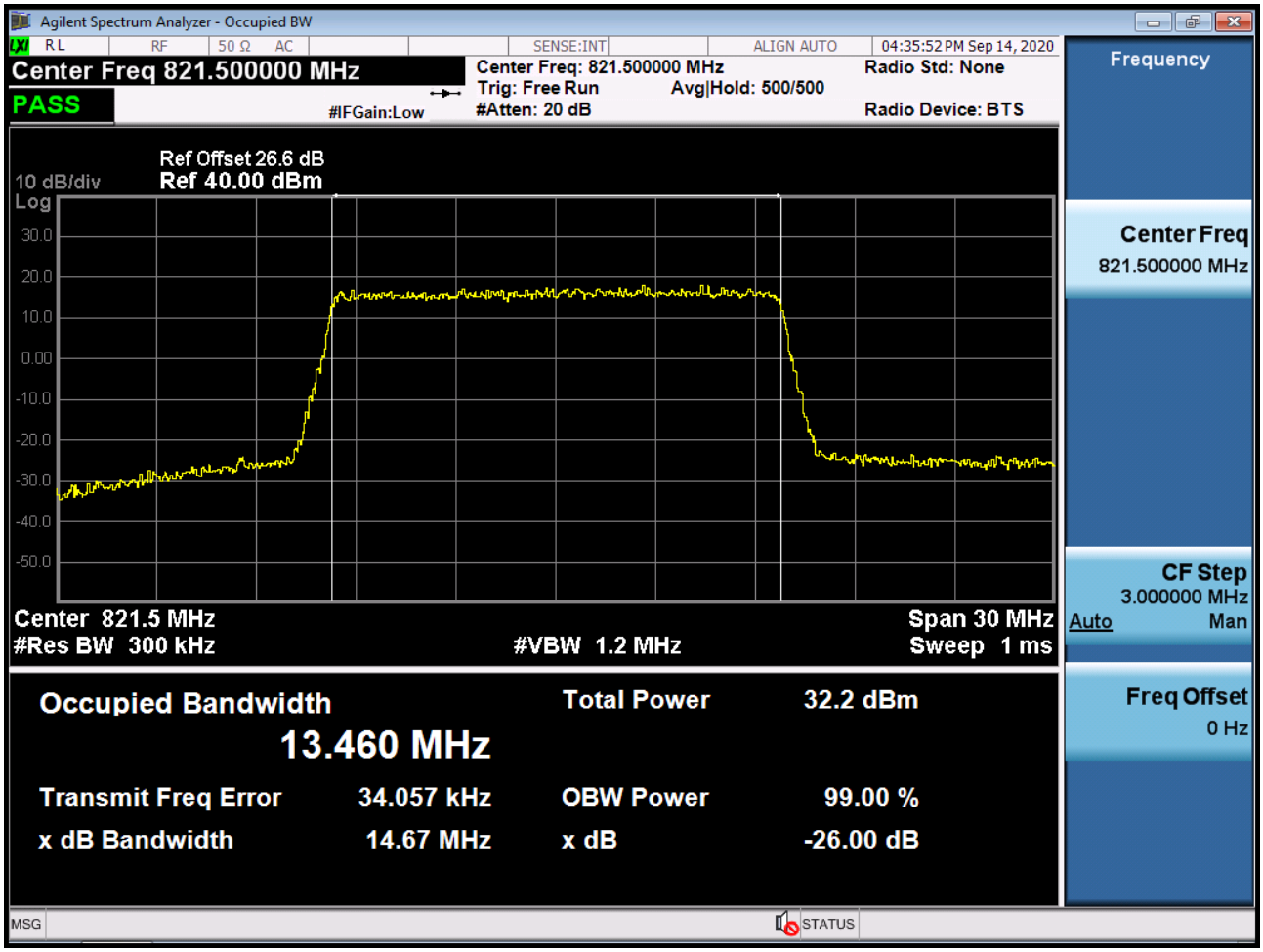
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 64QAM RB 50_0)



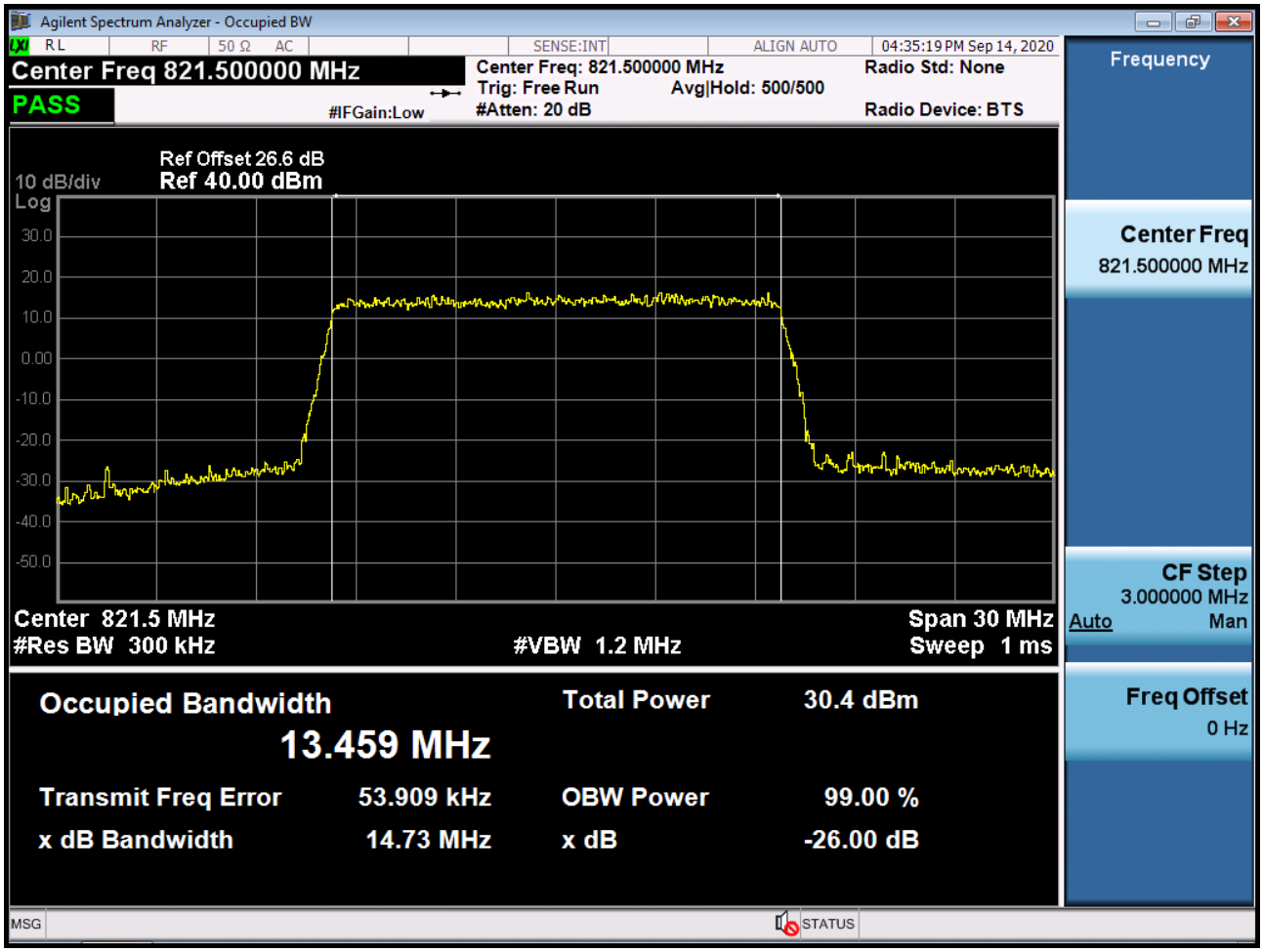
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 256QAM RB 50_0)



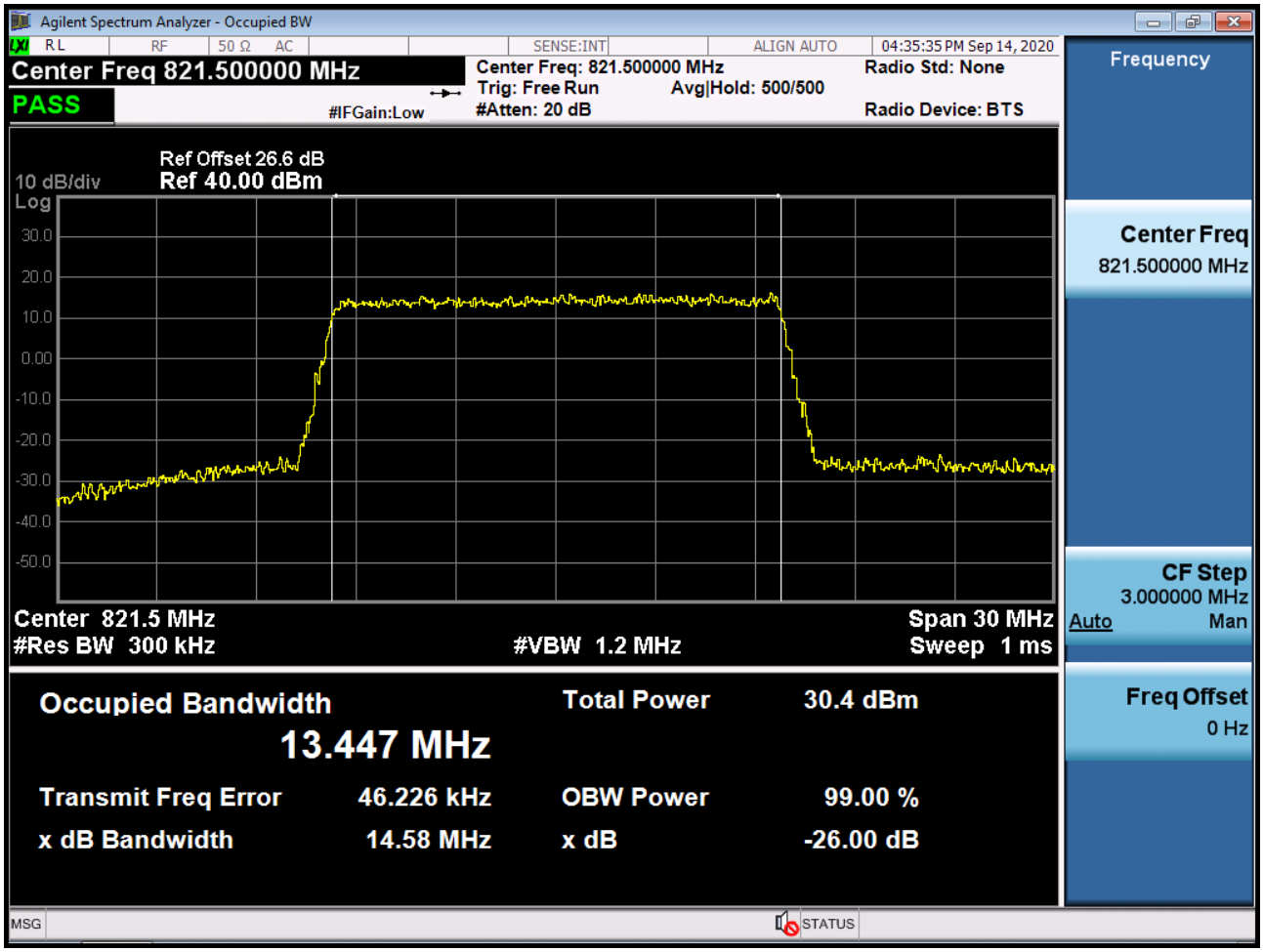
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 QPSK RB 75_0)



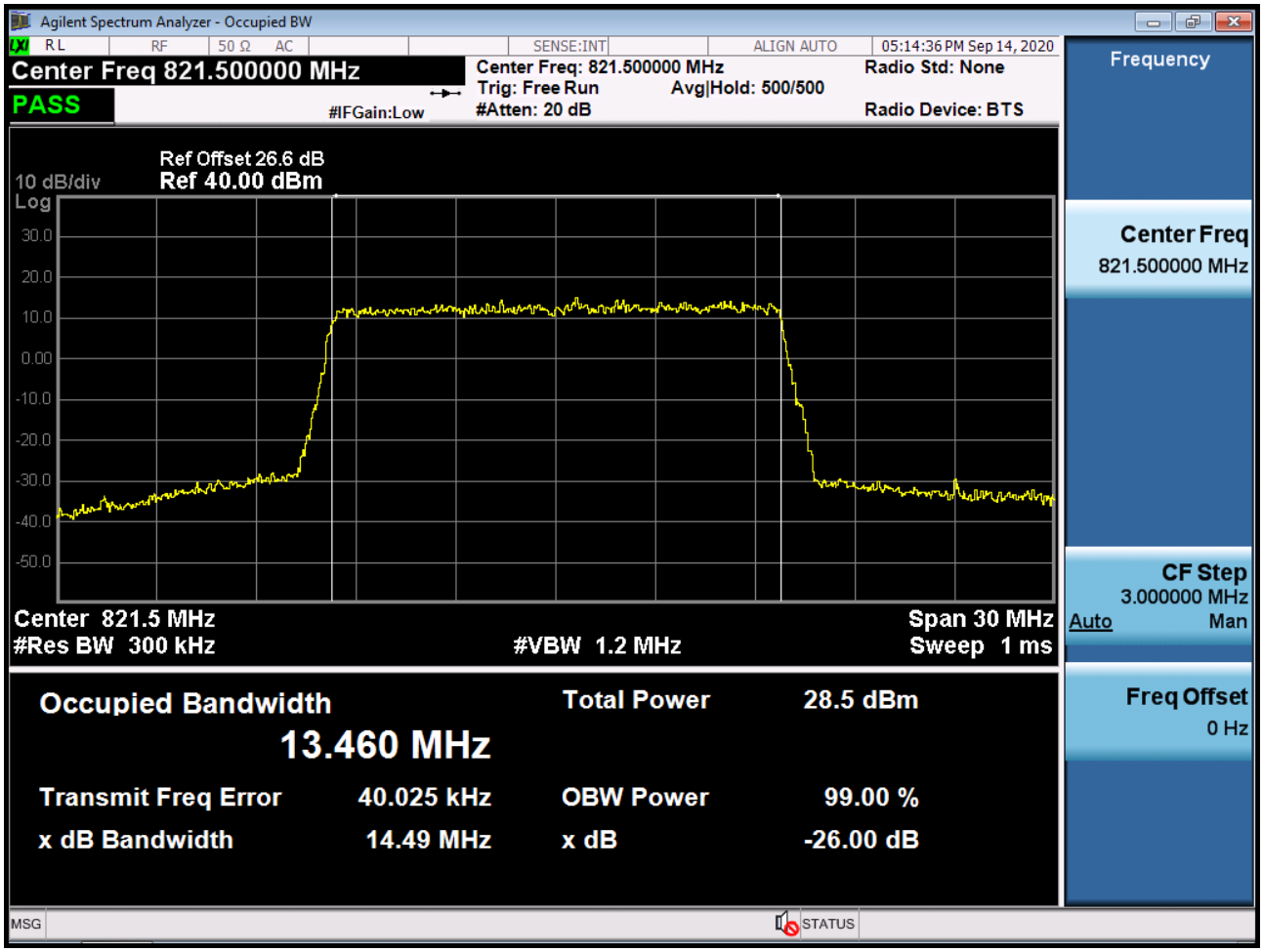
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 16QAM RB 75_0)



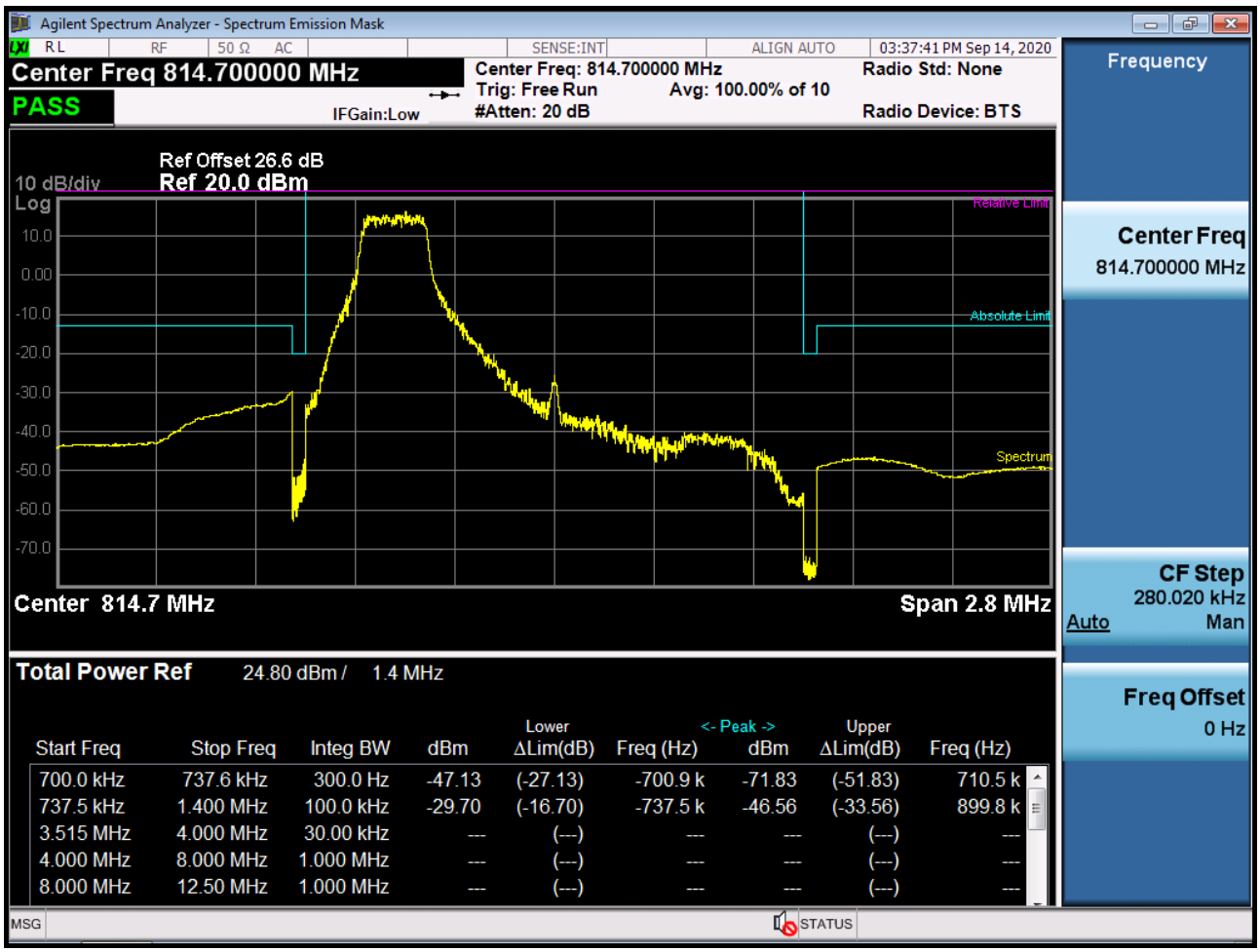
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 64QAM RB 75_0)



BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 256QAM RB 75_0)

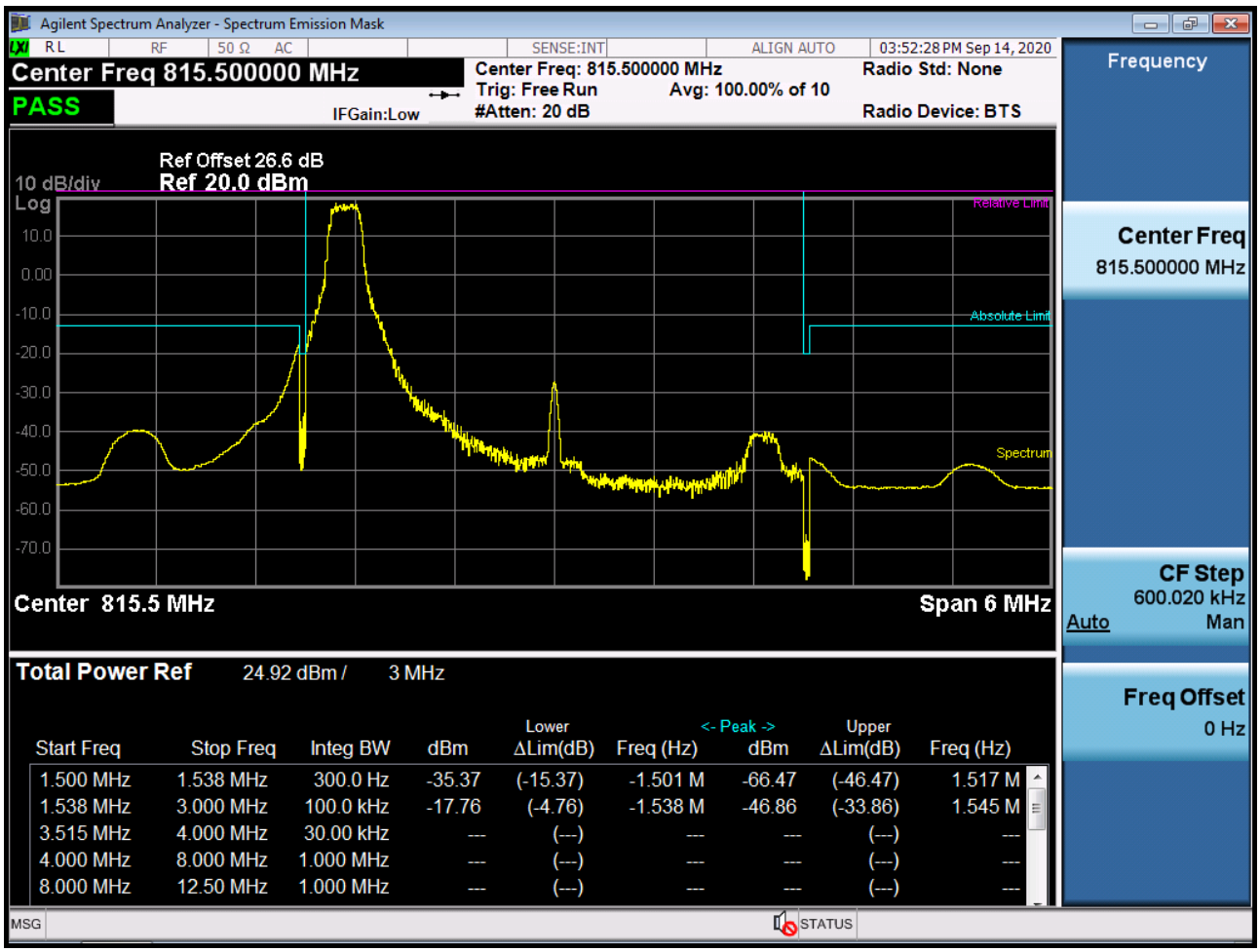


BAND 26. Lower Channel Edge Plot (1.4M BW Ch.26697 QPSK RB 1, Offset 0)



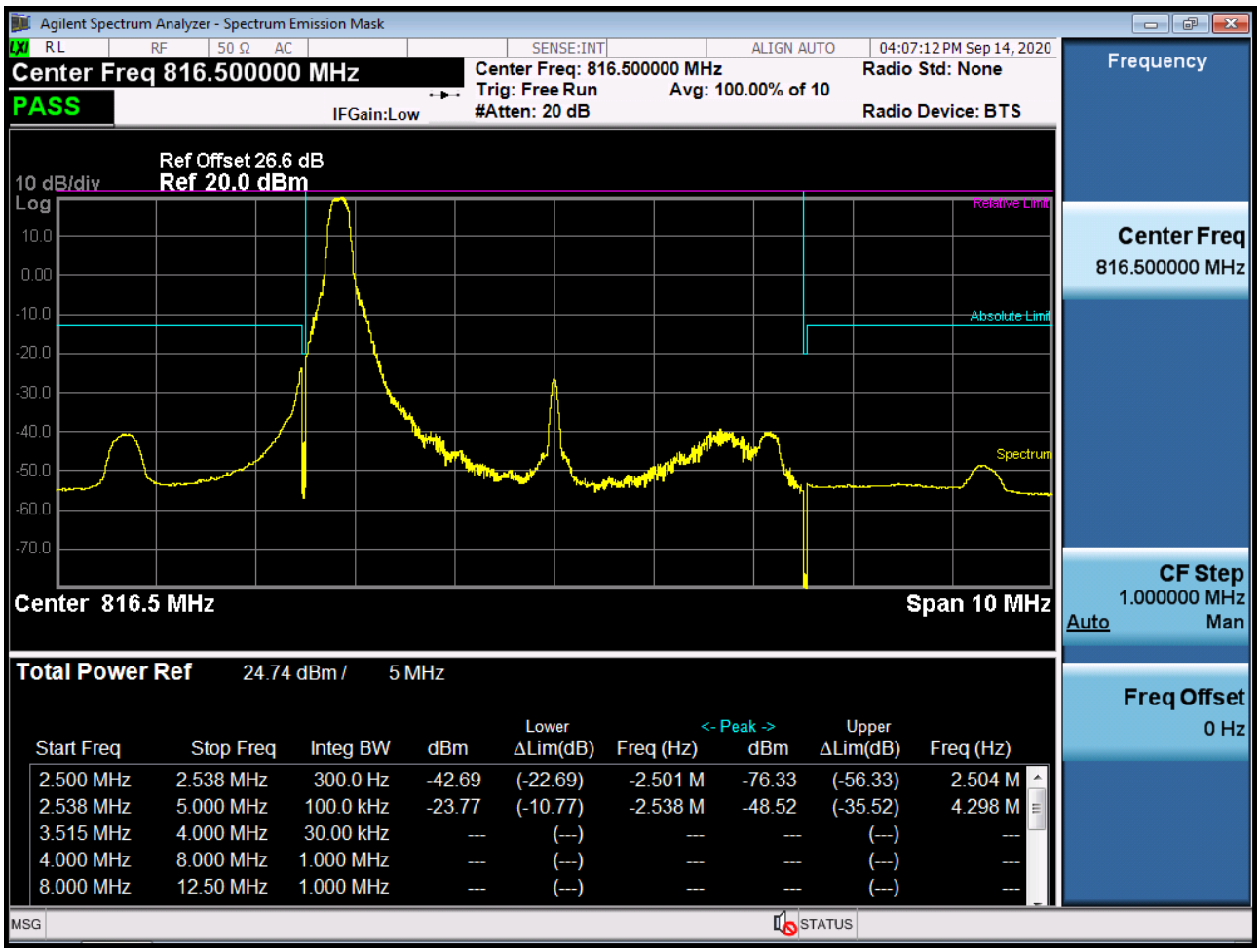
BAND 26. Lower Channel Edge Plot (1.4M BW Ch.26697 QPSK_RB6_Offset 0)

BAND 26. Lower Channel Edge Plot (3M BW Ch.26705 QPSK RB 1, Offset 0)

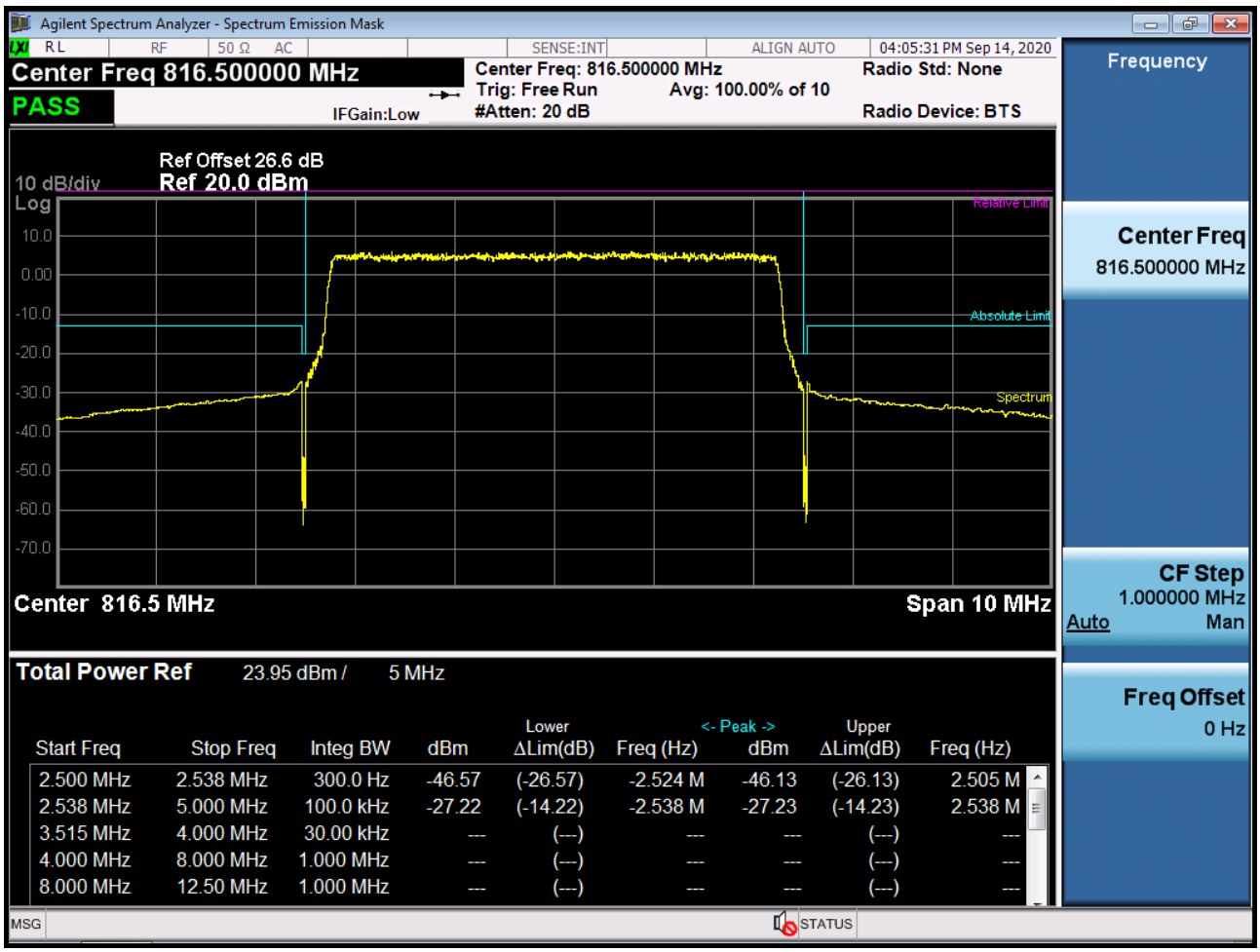


BAND 26. Lower Channel Edge Plot (3M BW Ch.26705 QPSK_RB15_Offset 0)

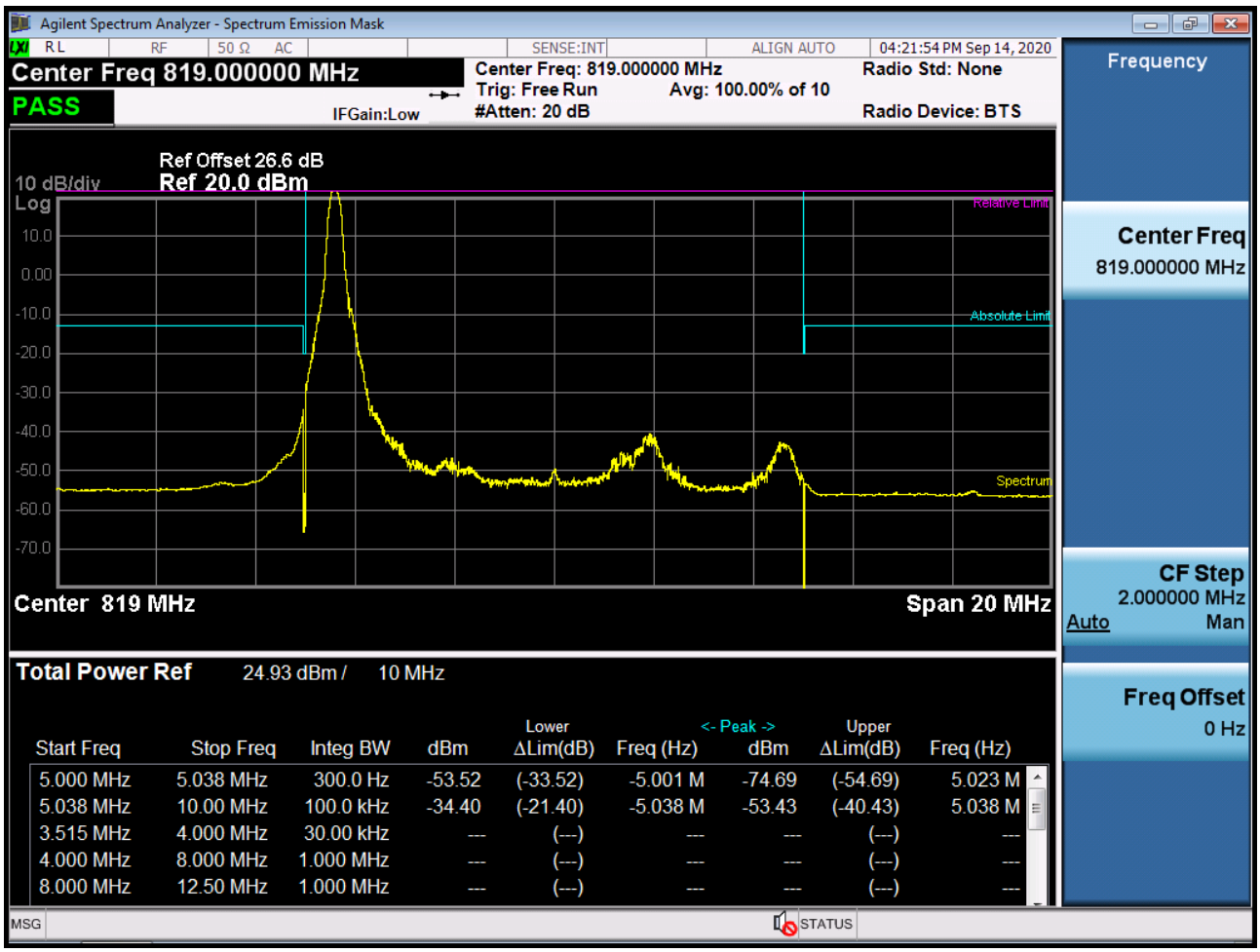
BAND 26. Lower Channel Edge Plot (5M BW Ch.26715 QPSK RB 1, Offset 0)



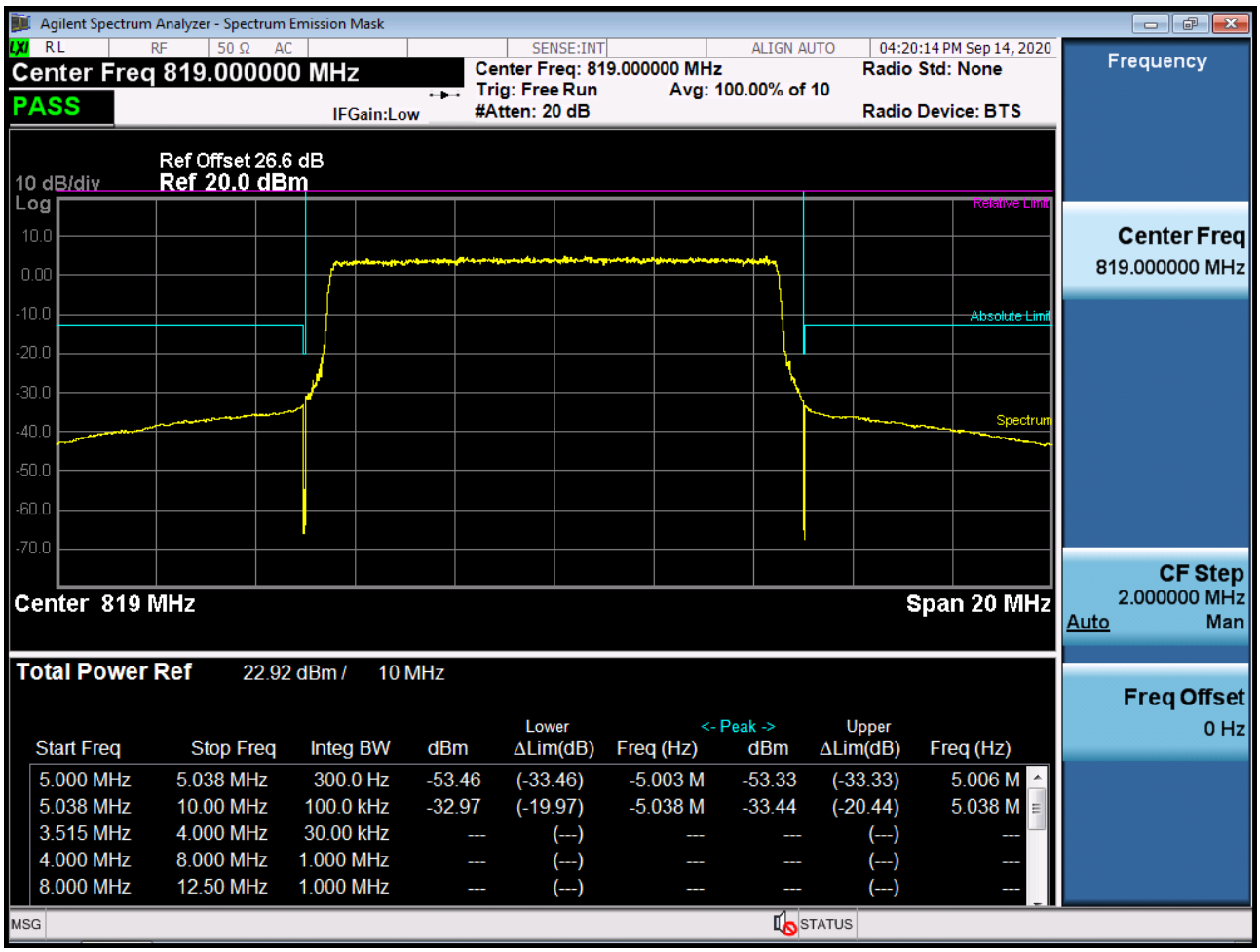
BAND 26. Lower Channel Edge Plot (5M BW Ch.26715 QPSK_RB25_Offset 0)



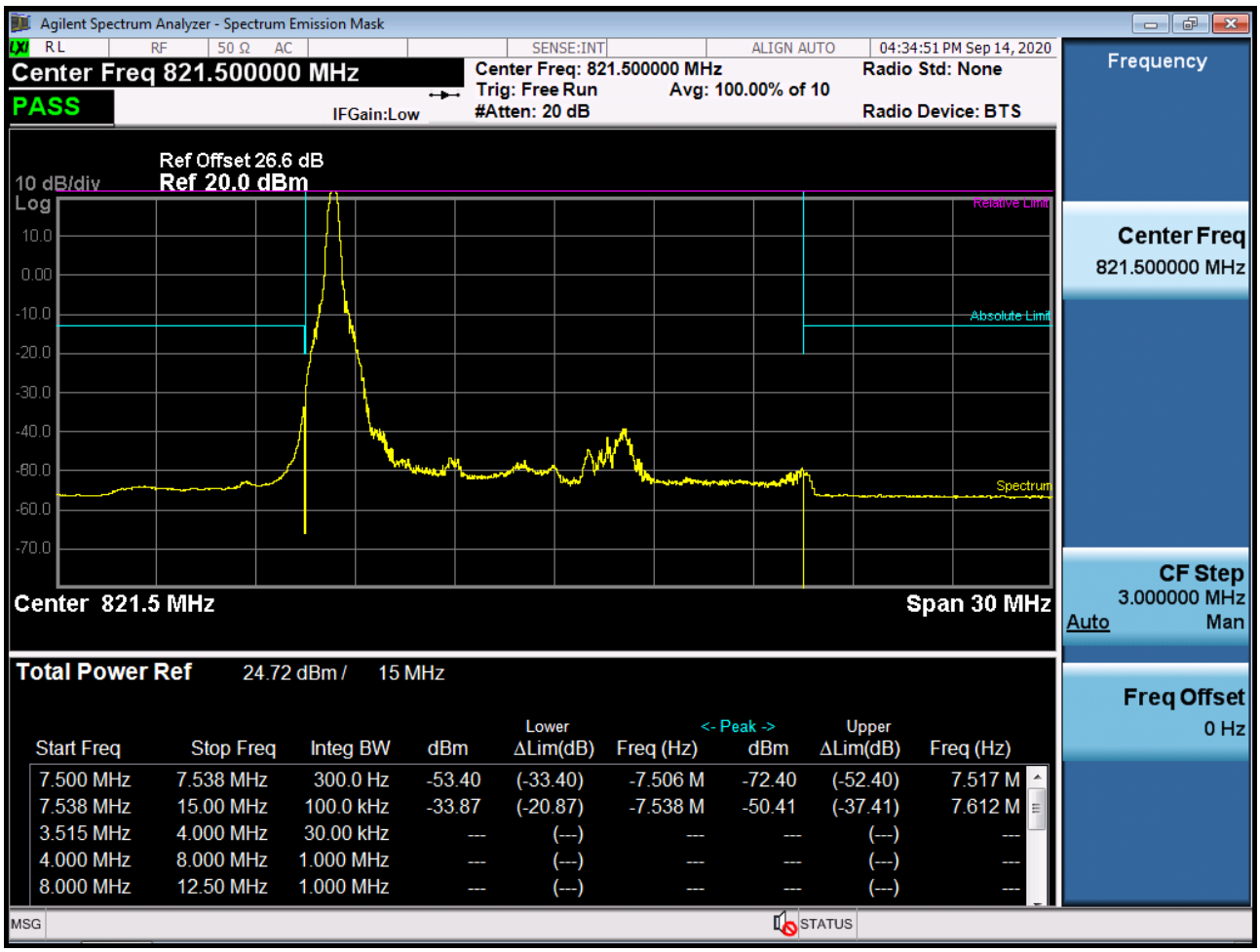
BAND 26. Low Channel Edge Plot (10M BW Ch.26740 QPSK RB 1, Offset 0)



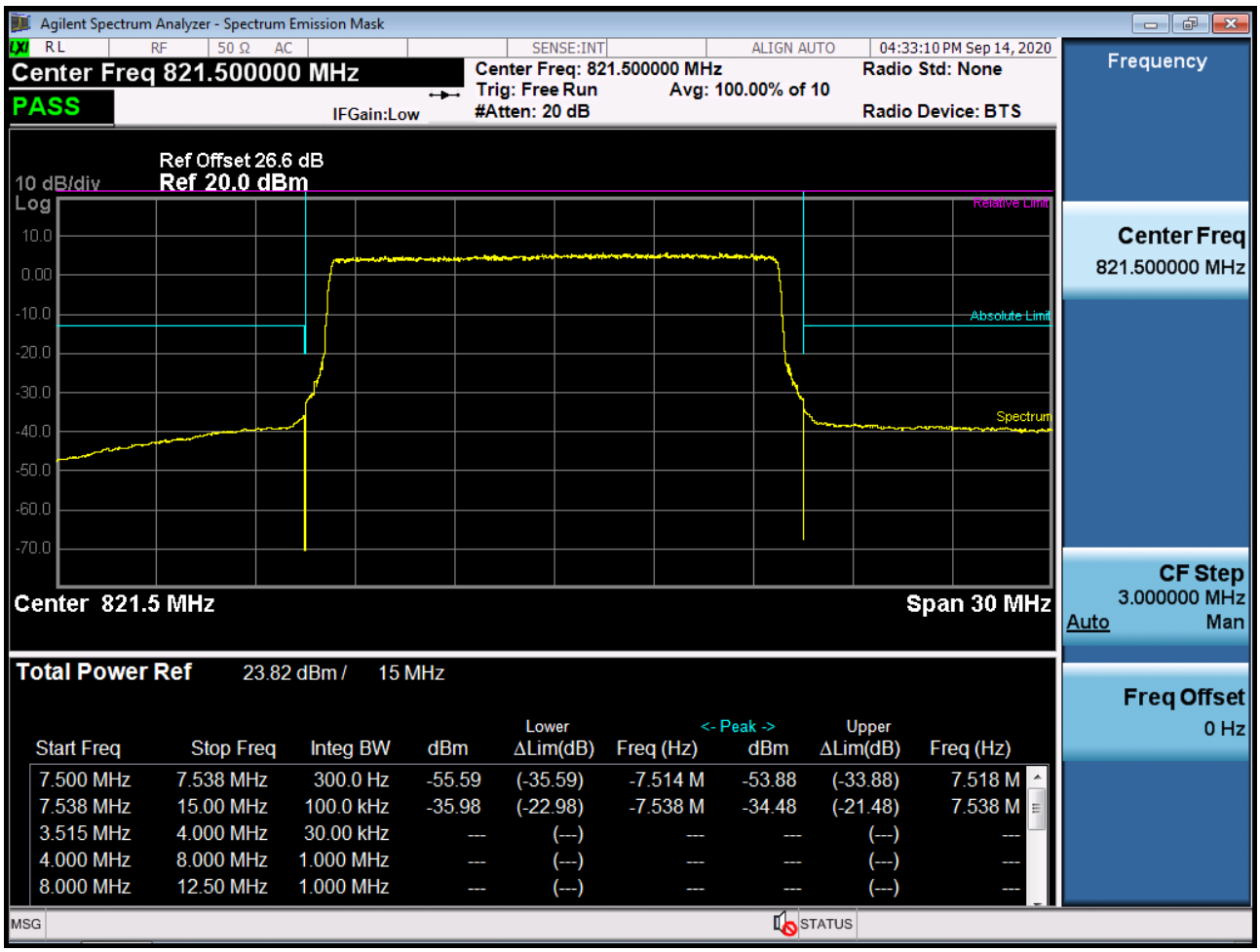
BAND 26. Low Channel Edge Plot (10M BW Ch.26740 QPSK_RB50_Offset 0)



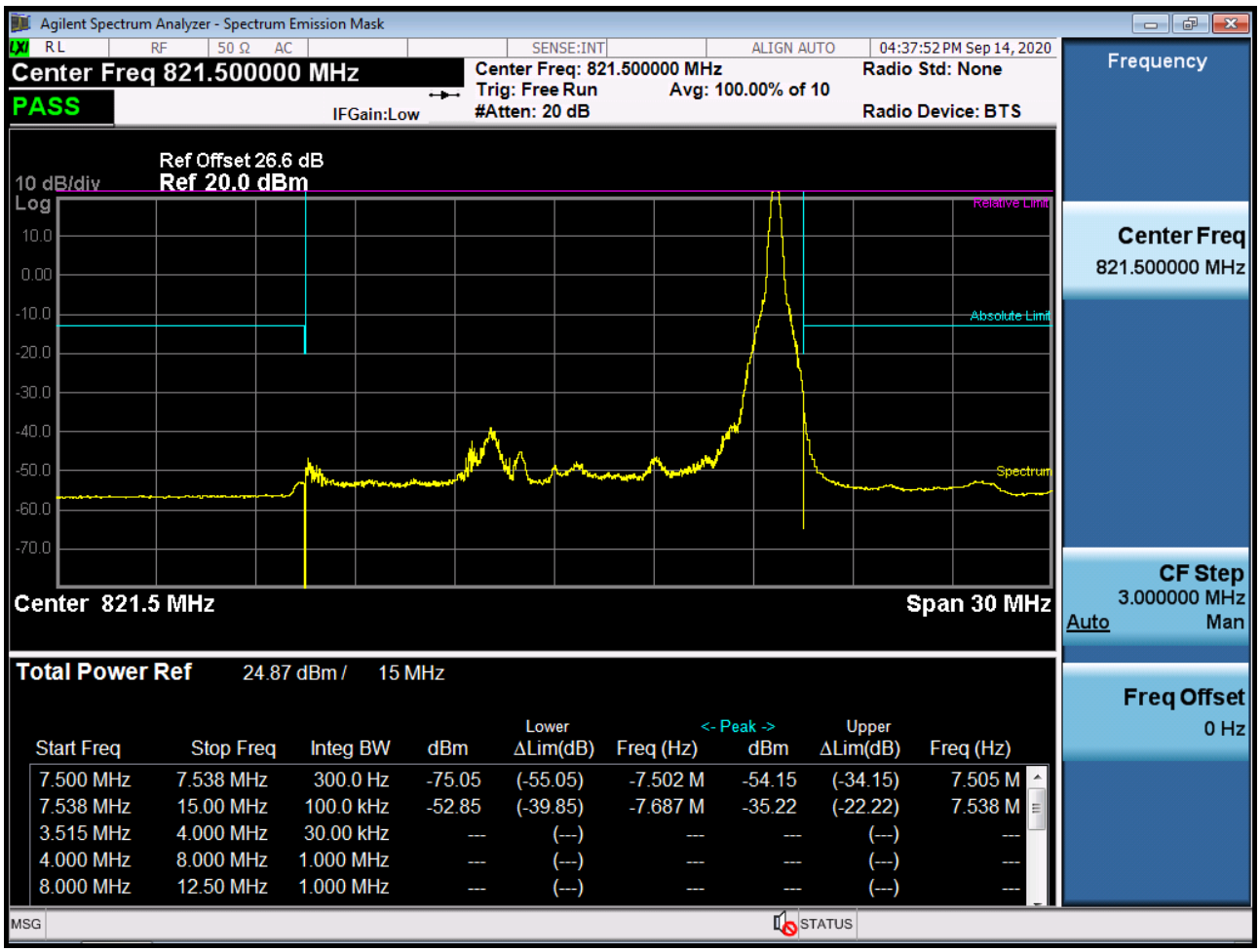
BAND 26. Low Channel Edge Plot (15M BW Ch.26765 QPSK RB 1, Offset 0)



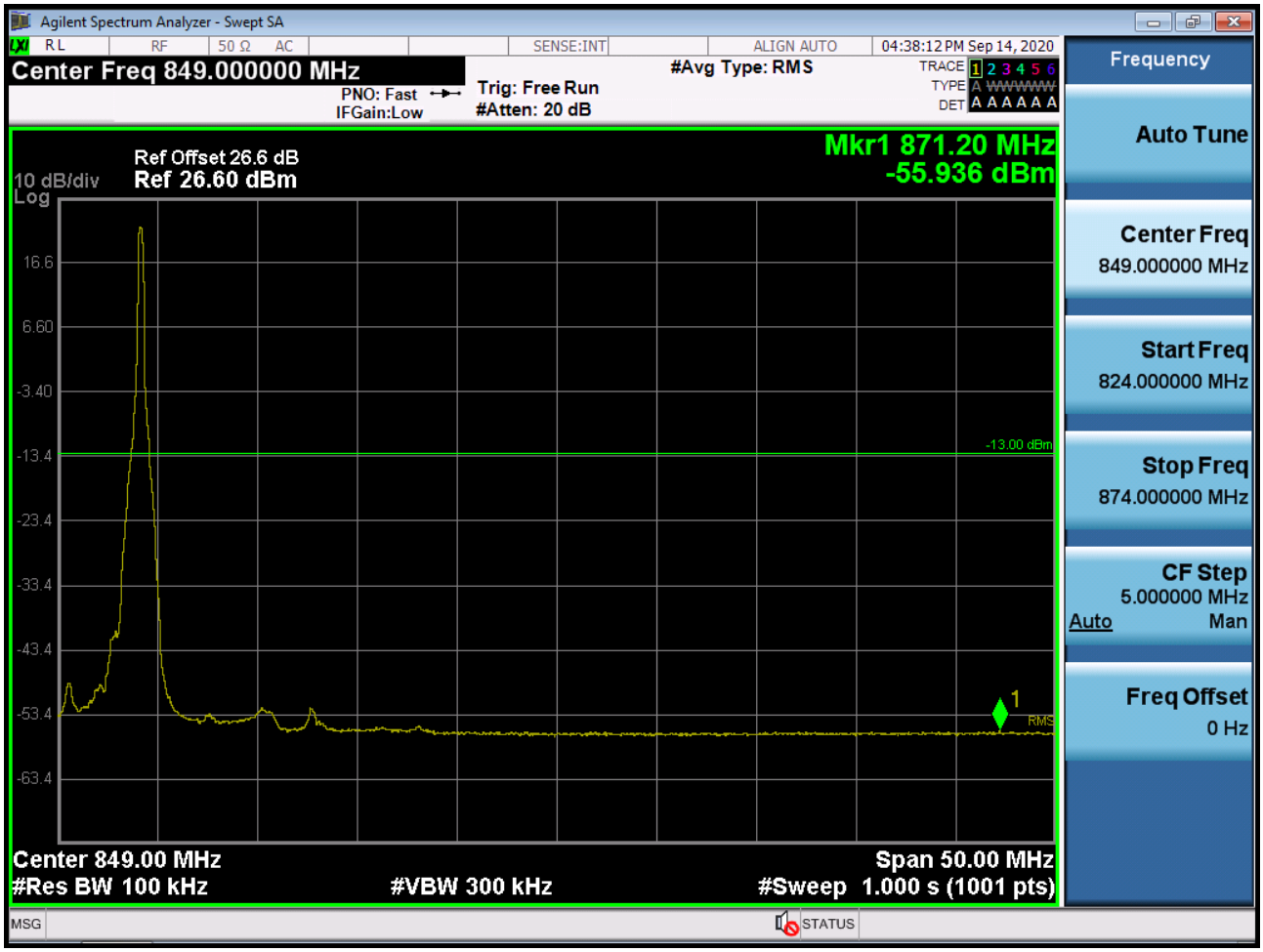
BAND 26. Low Channel Edge Plot (15M BW Ch.26765 QPSK RB 75, Offset0)



BAND 26. Mid Channel Edge Plot (15M BW Ch.26765 QPSK_RB1_Offset 74)

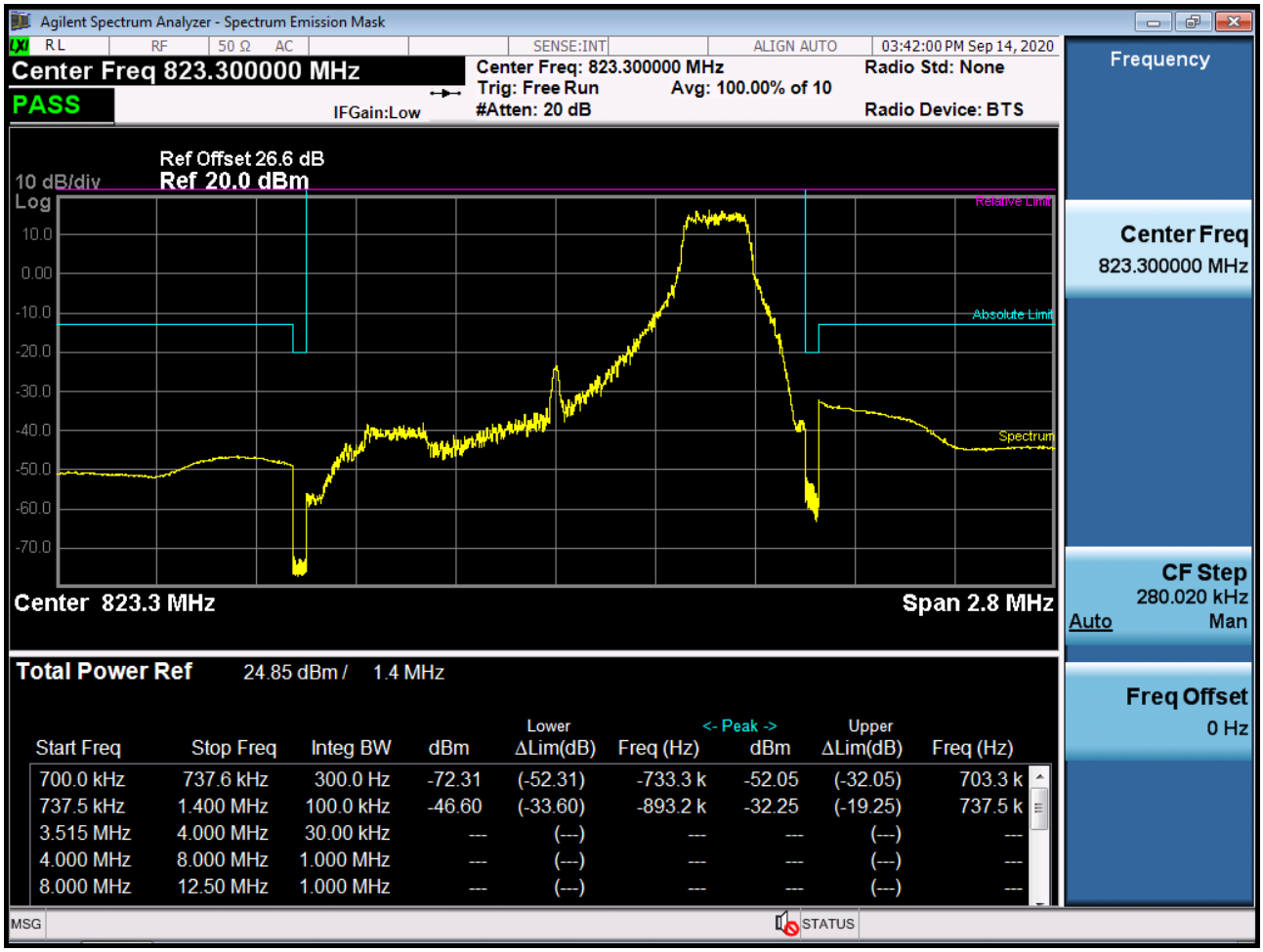


BAND 26. Mid Band Edge Plot (15M BW Ch.26765 QPSK RB 1, Offset74)

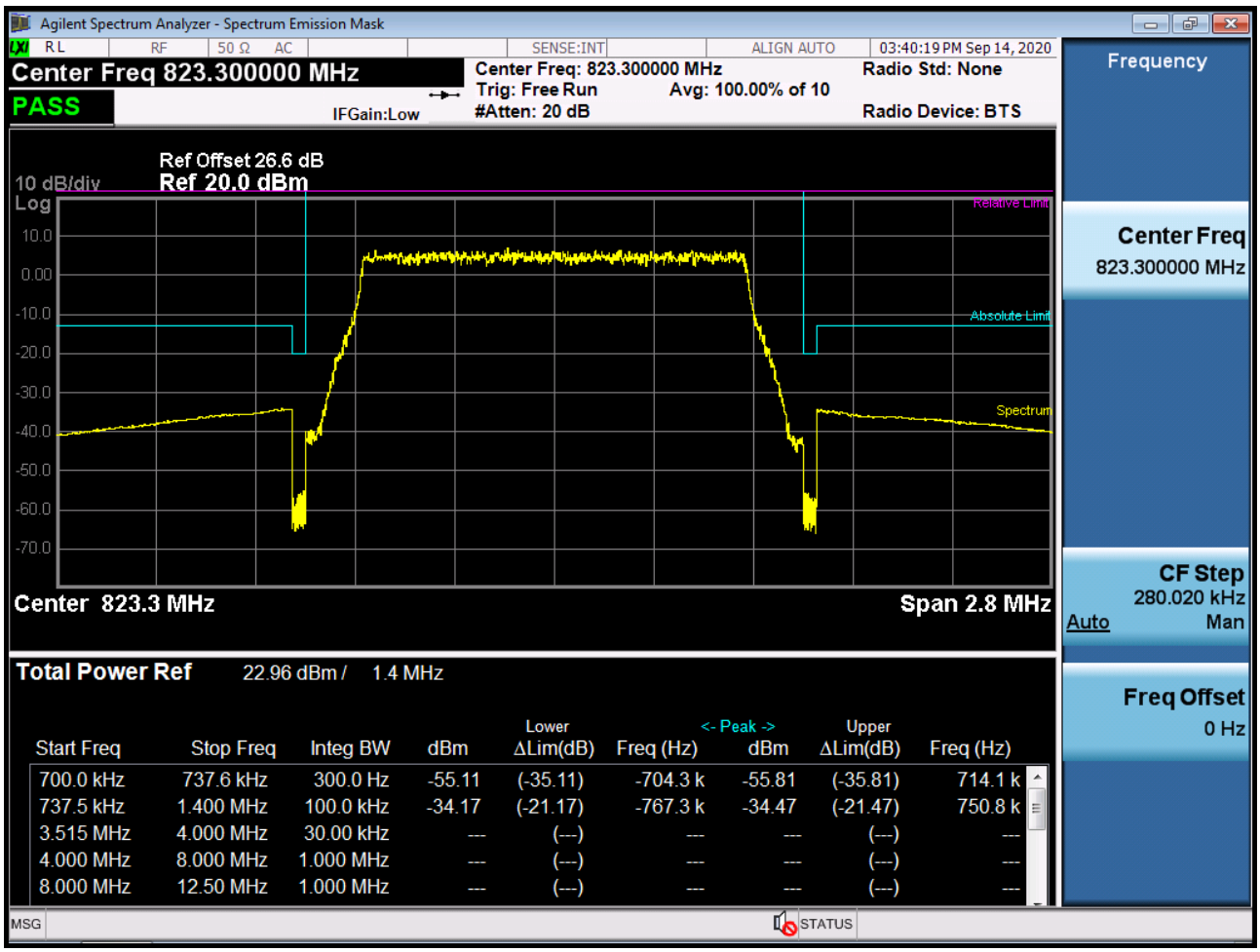


BAND 26. Mid Band Edge Plot (15M BW Ch.26765 QPSK_RB75_Offset 0)

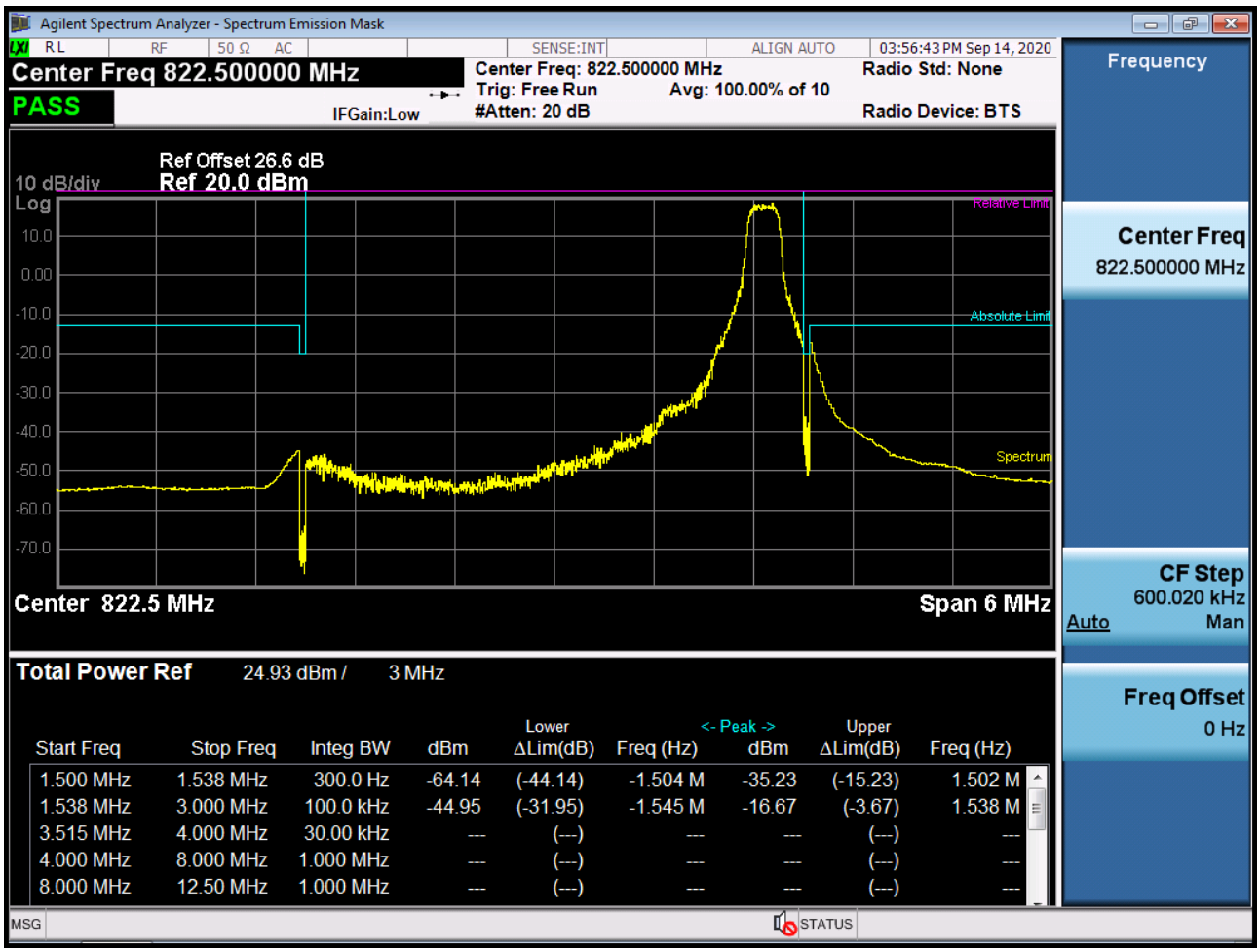
BAND 26. Upper Channel Edge Plot (1.4M BW Ch.26783 QPSK_RB1_Offset 5)



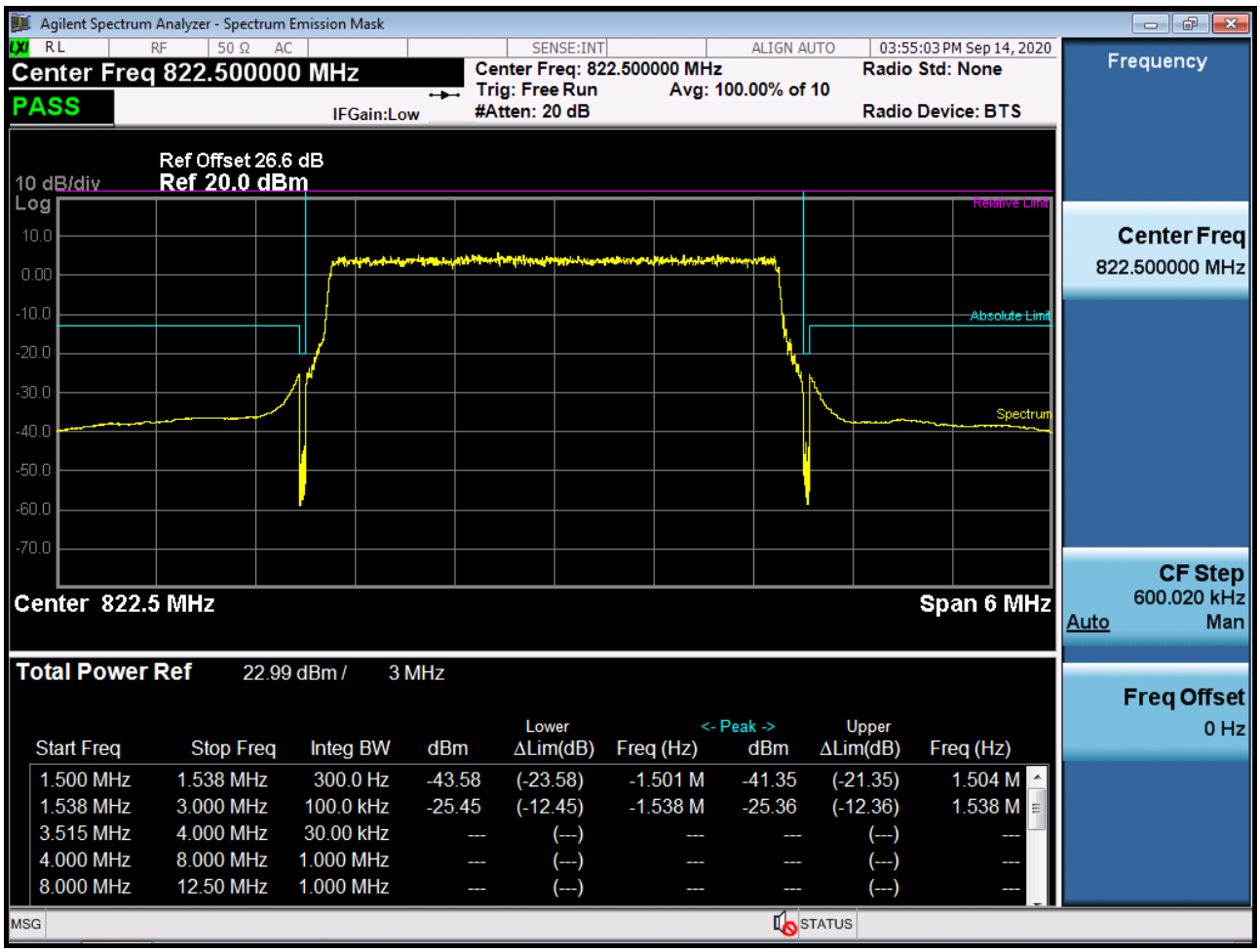
BAND 26. Upper Channel Edge Plot (1.4M BW Ch.26783 QPSK_RB6_Offset 0)



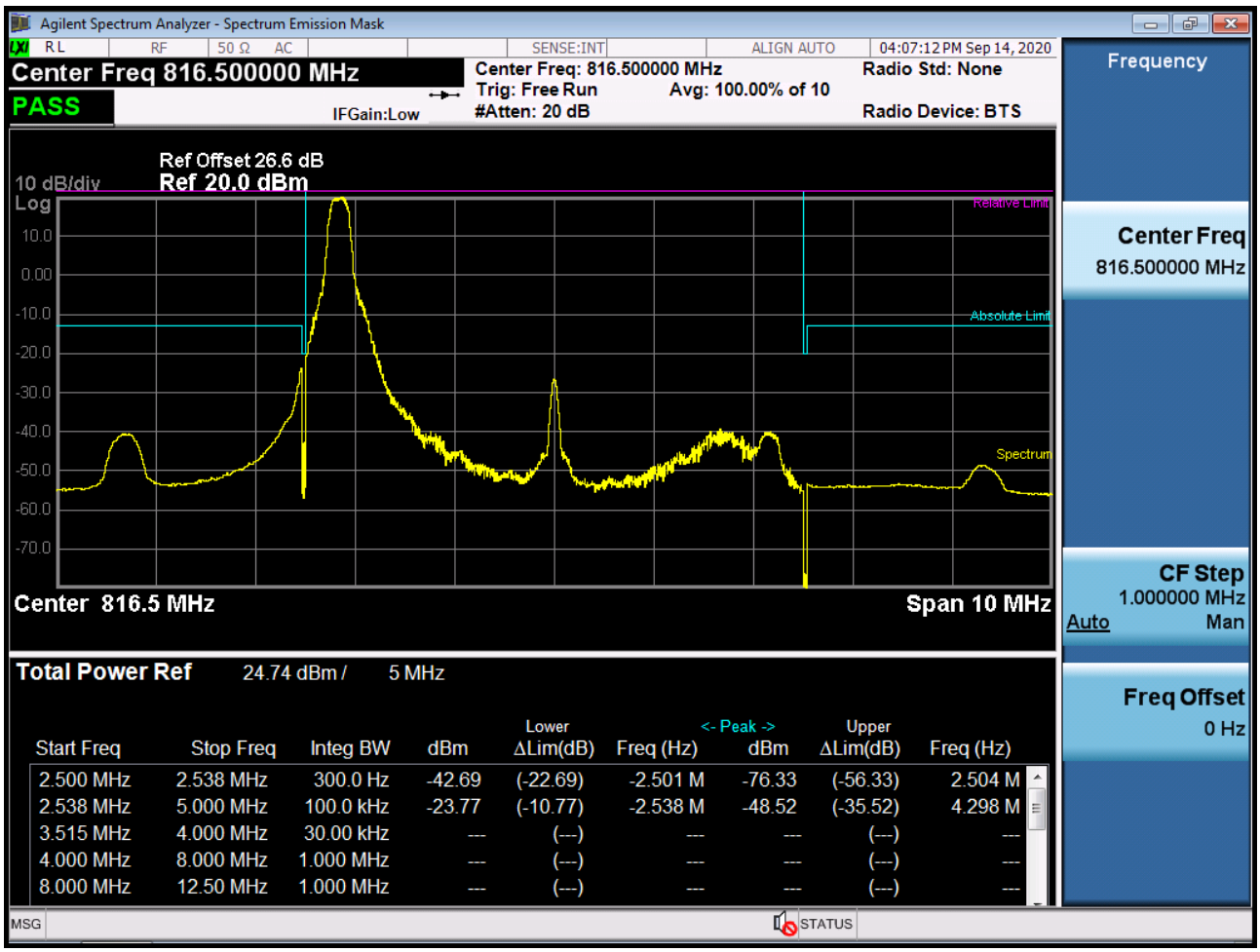
BAND 26. Upper Channel Edge Plot (3M BW Ch.26775 QPSK_RB1_Offset 14)



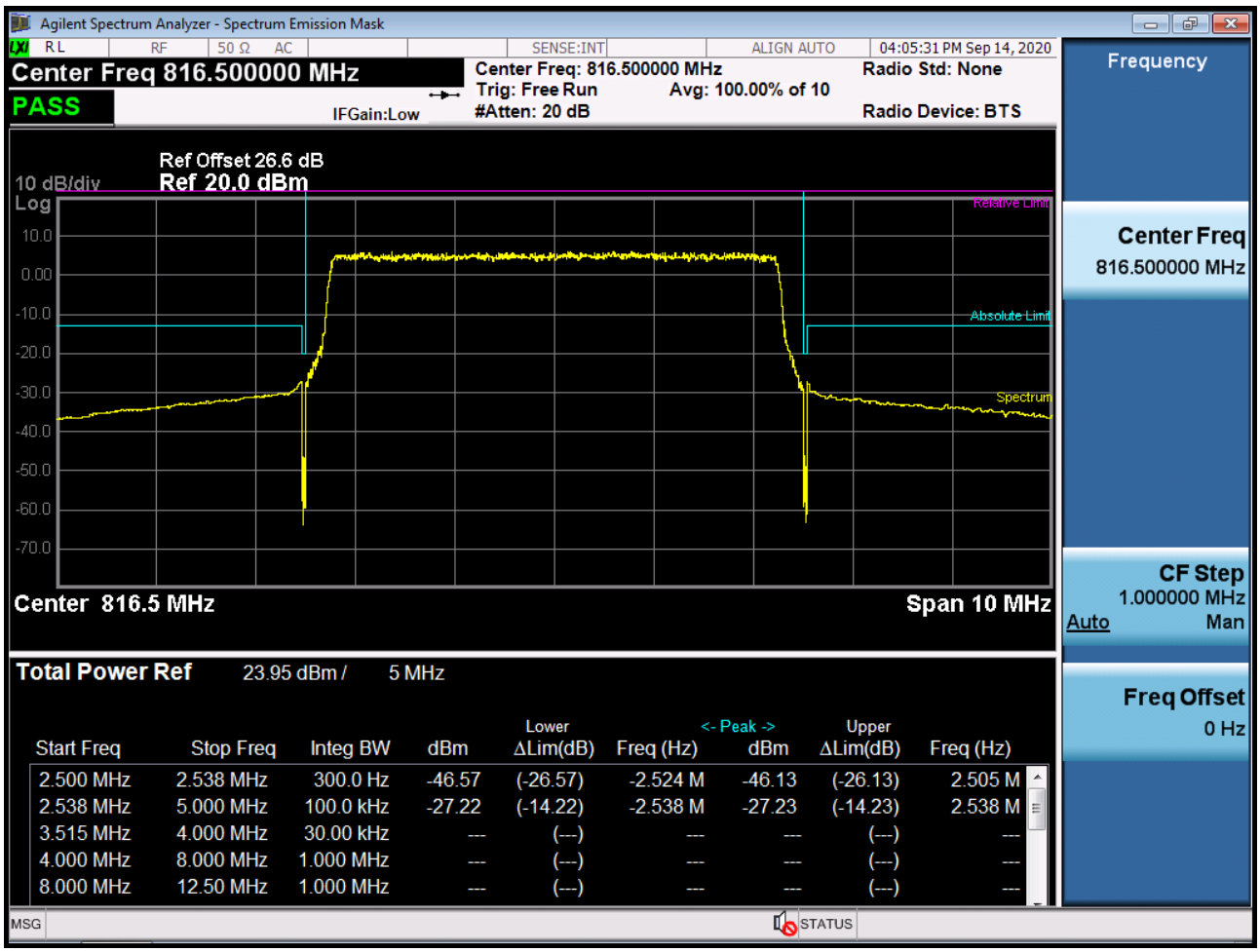
BAND 26. Upper Channel Edge Plot (3M BW Ch.26775 QPSK_RB15_Offset 0)



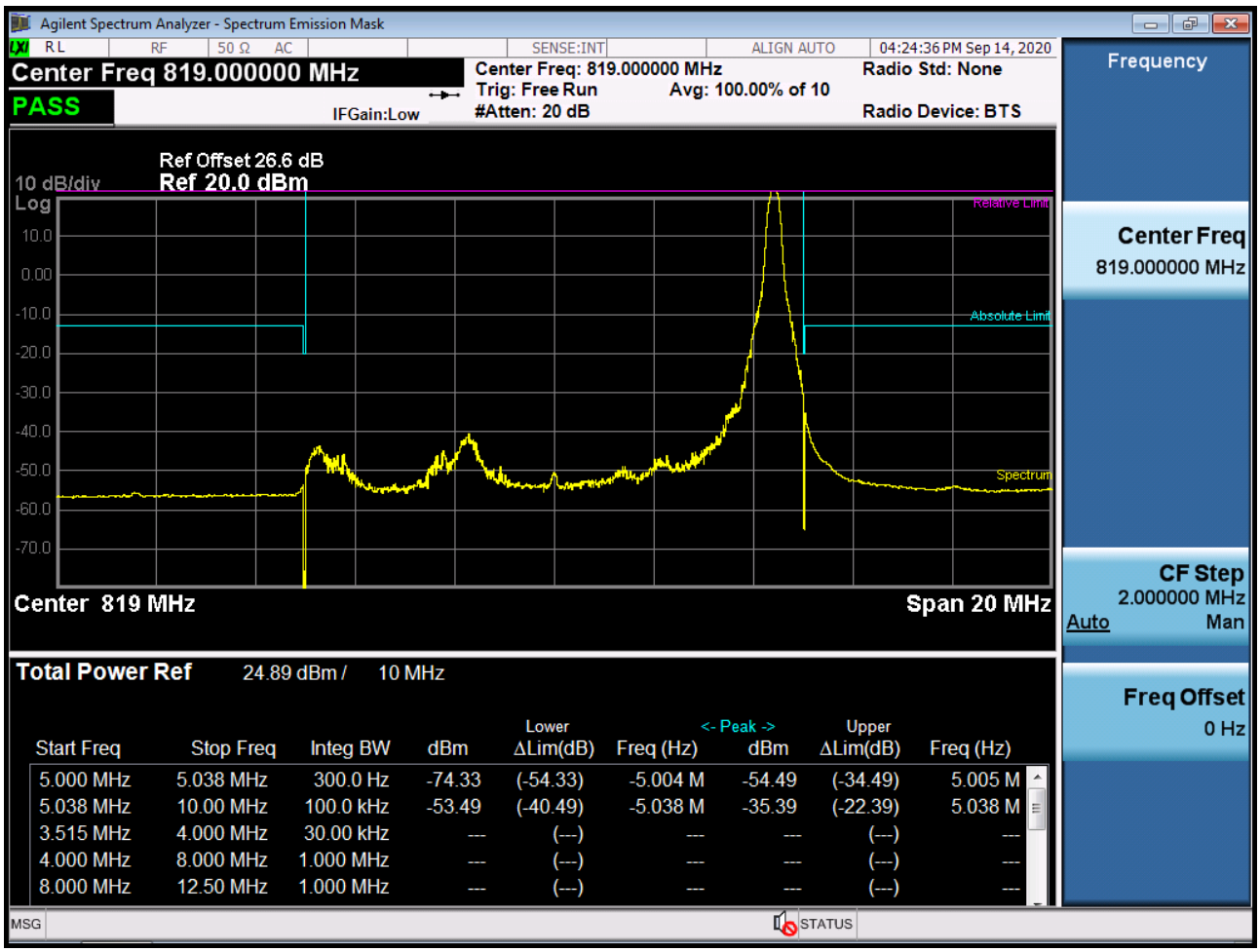
BAND 26. Upper Channel Edge Plot (5M BW Ch.26765 QPSK_RB1_Offset 24)



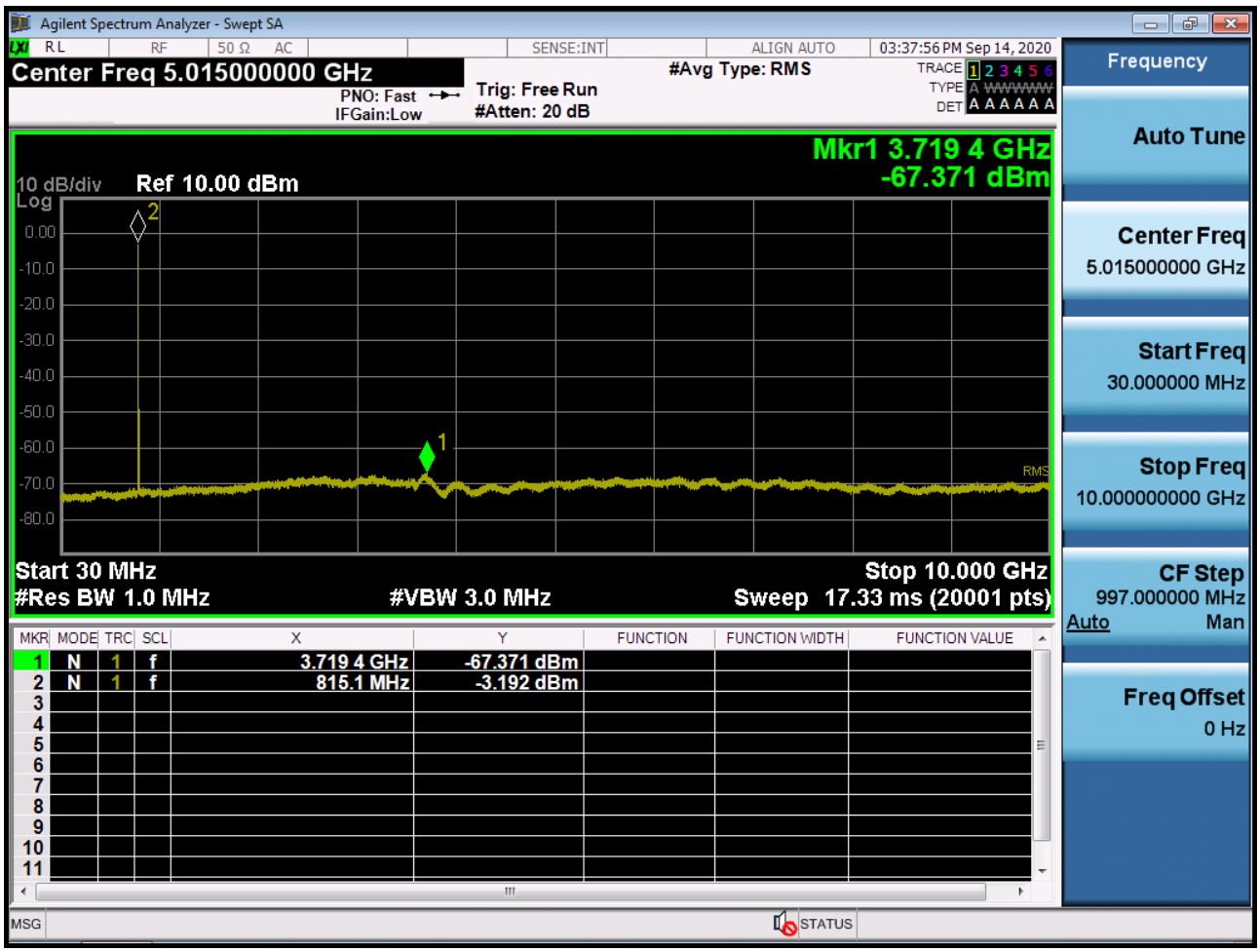
BAND 26. Upper Channel Edge Plot (5M BW Ch.26765 QPSK_RB25_Offset 0)



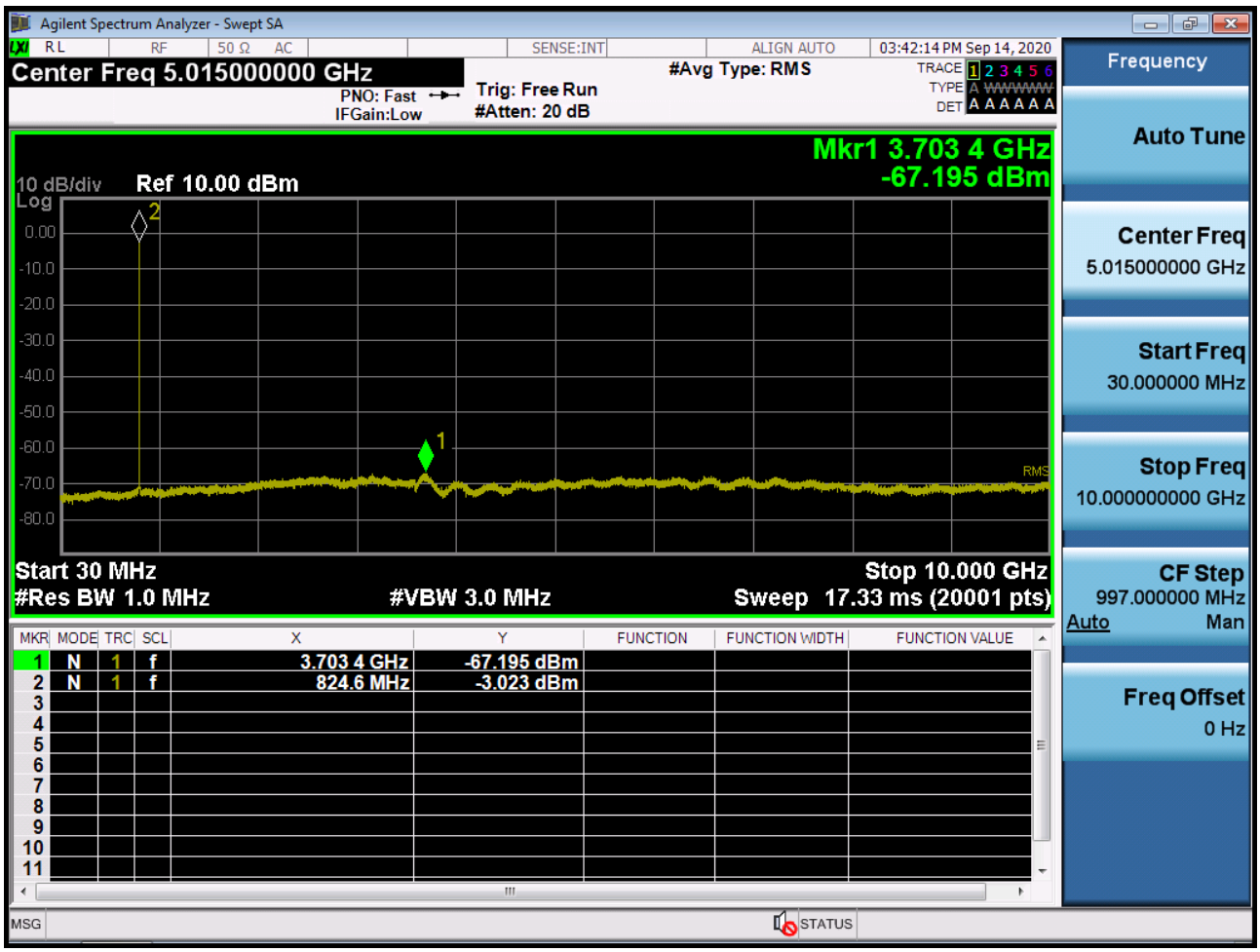
BAND 26. Mid Channel Edge Plot (10M BW Ch. 26740 QPSK_RB1_Offset 49)



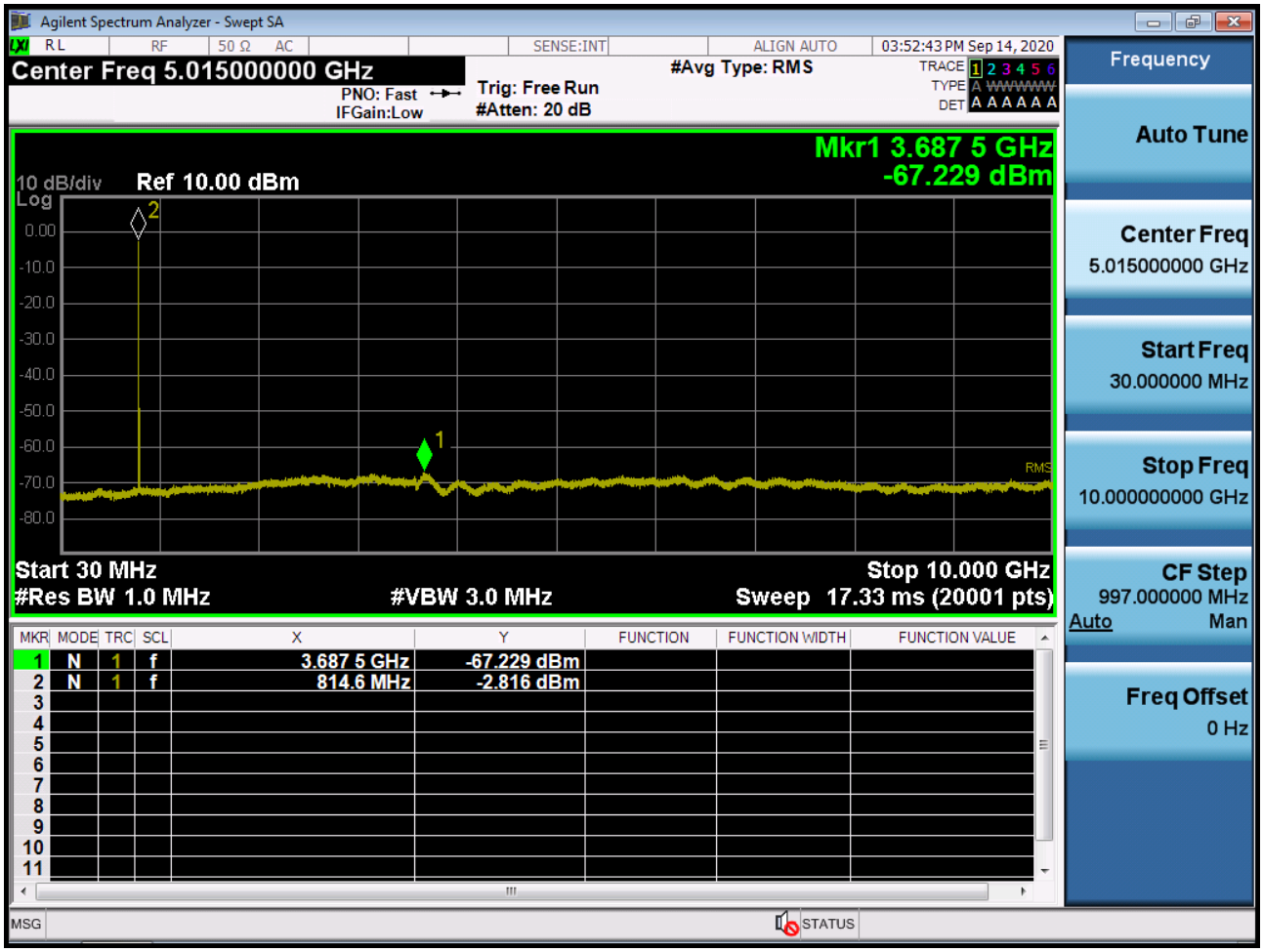
BAND 26. Conducted Spurious (26697 ch_1.4MHz_QPSK_RB 1_0)



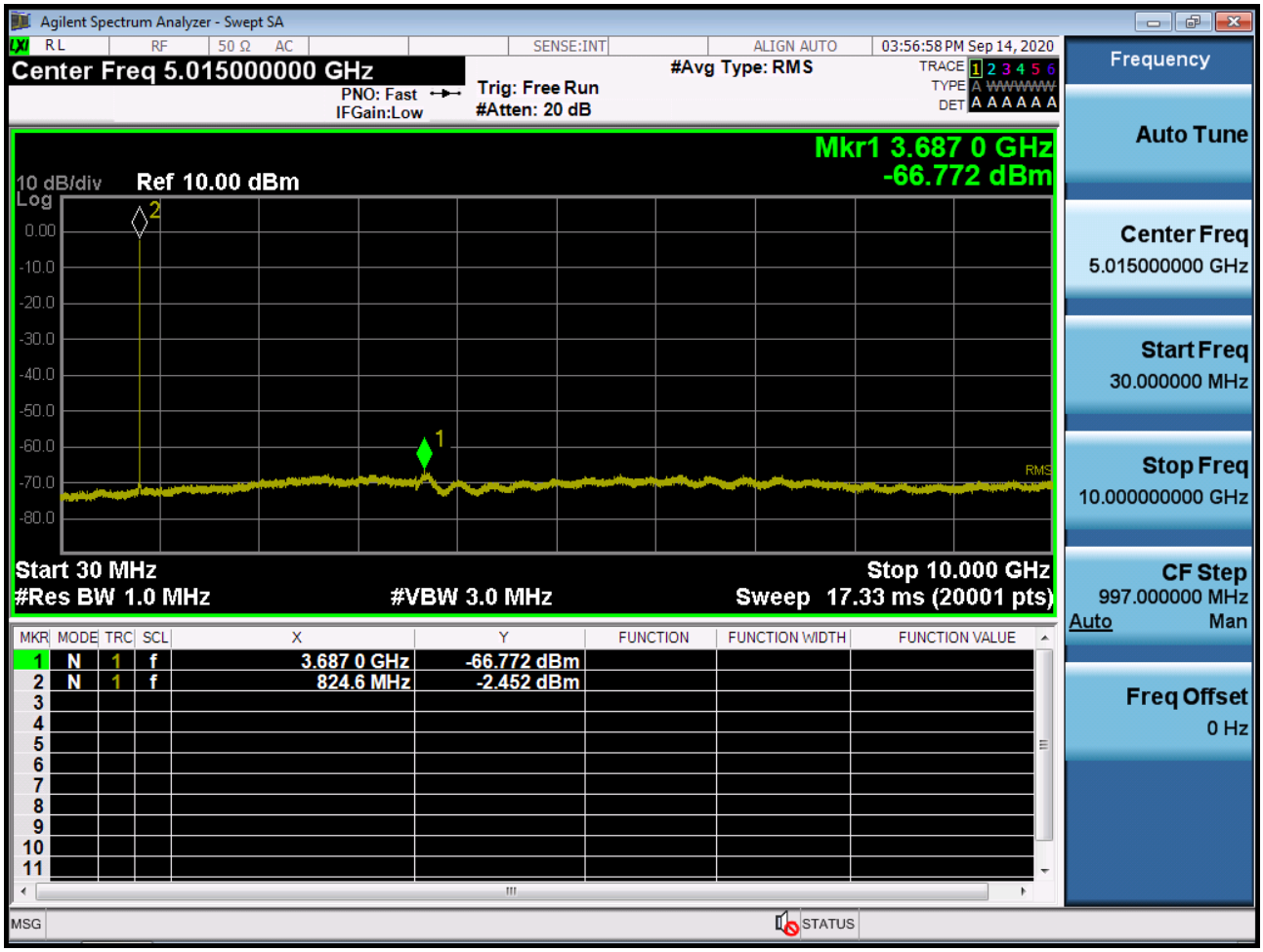
BAND 26. Conducted Spurious (26783 ch_1.4MHz_QPSK_RB 1_0)



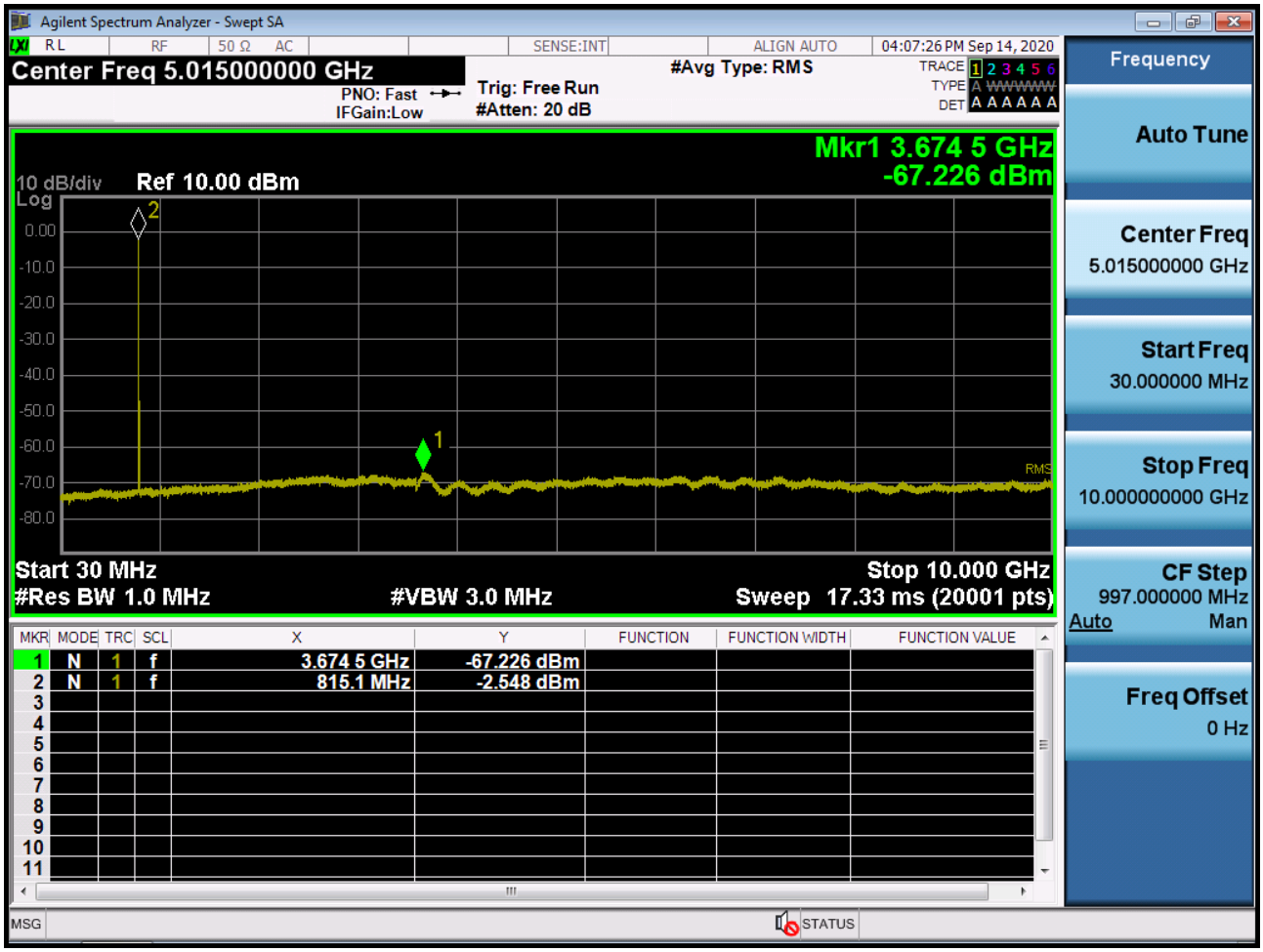
BAND 26. Conducted Spurious (26705 ch_3MHz_QPSK_RB 1_0)



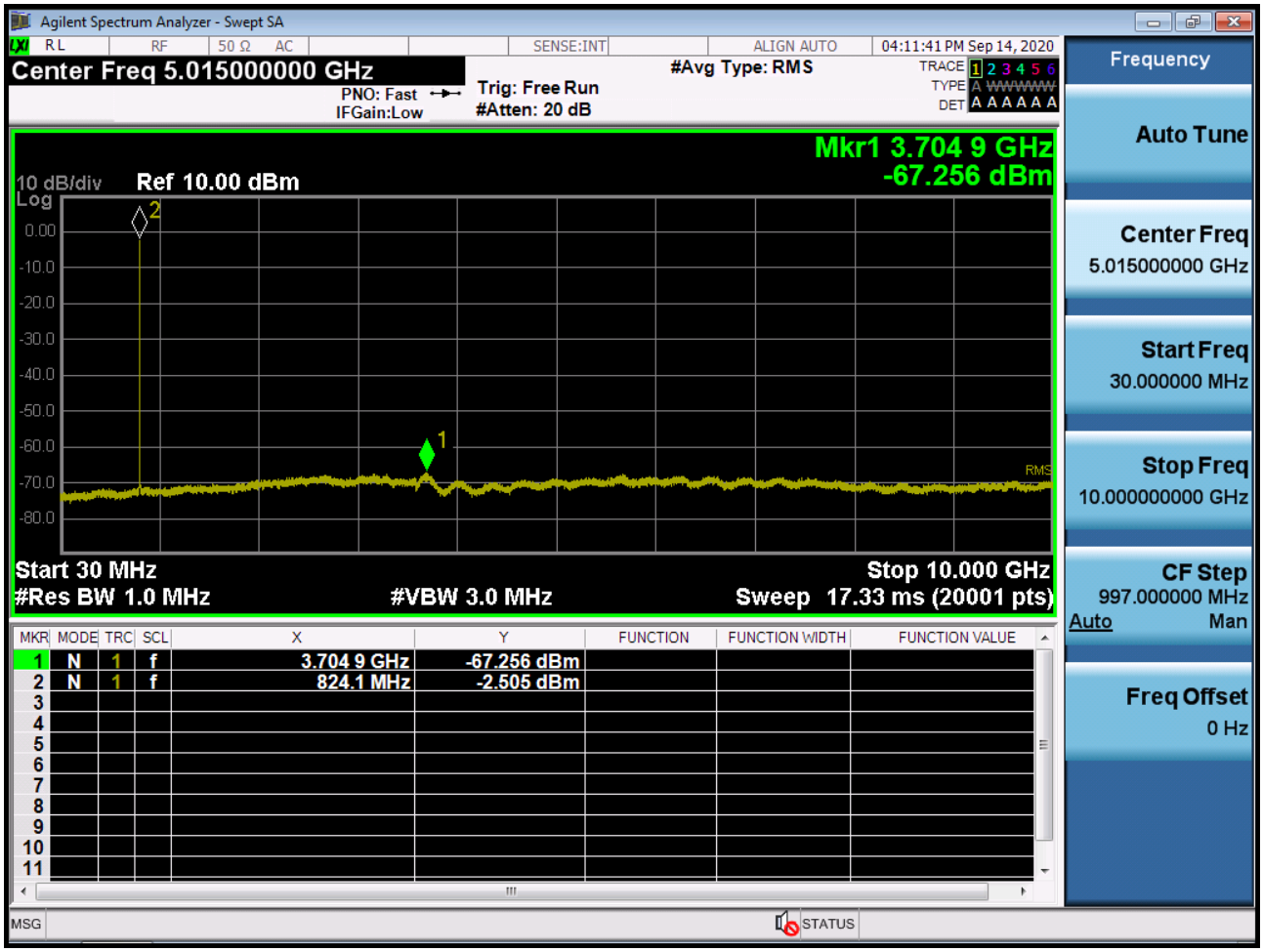
BAND 26. Conducted Spurious (26775 ch_3MHz_QPSK_RB 1_0)



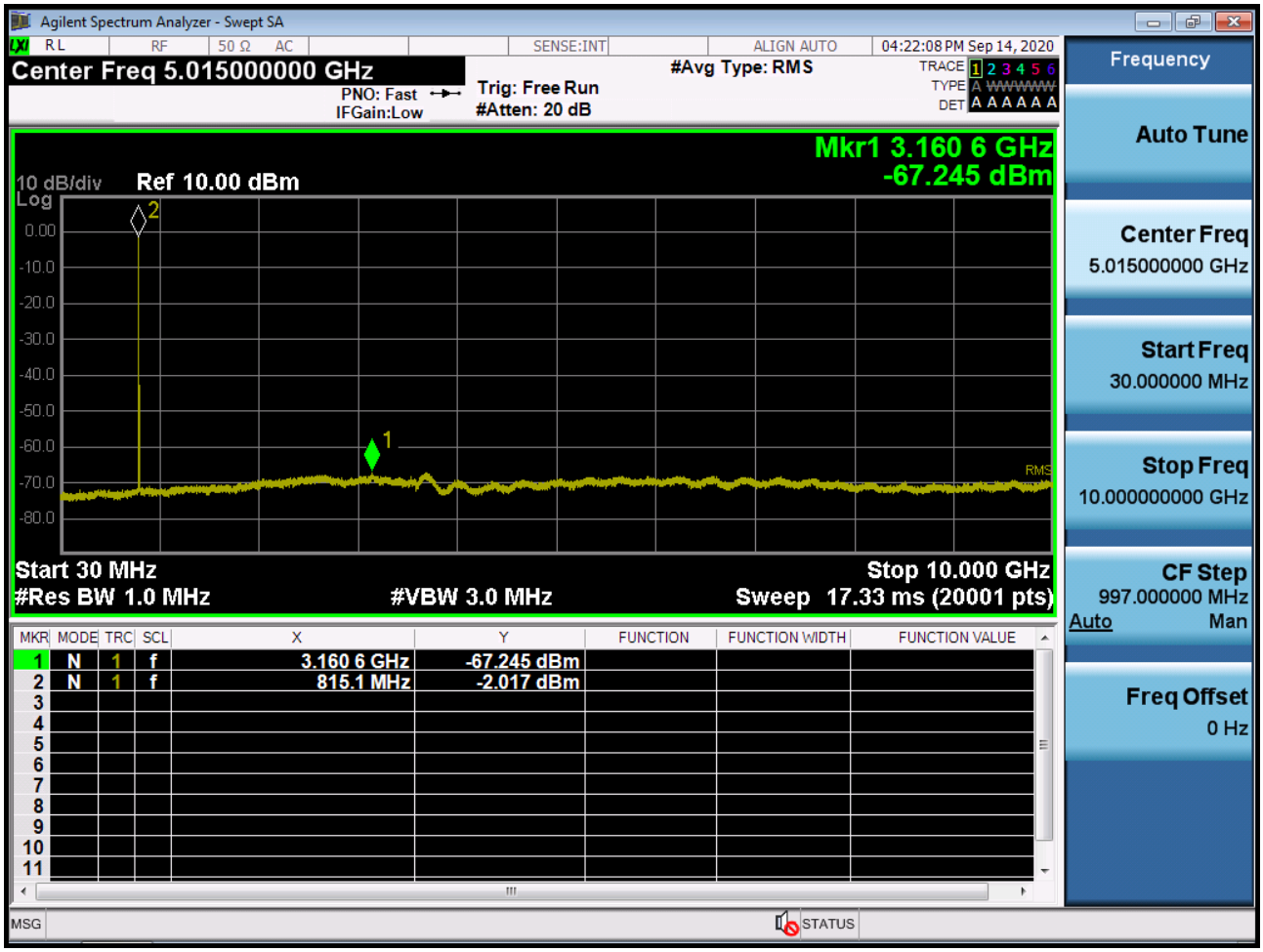
BAND 26. Conducted Spurious (26715 ch_5MHz_QPSK_RB 1_0)



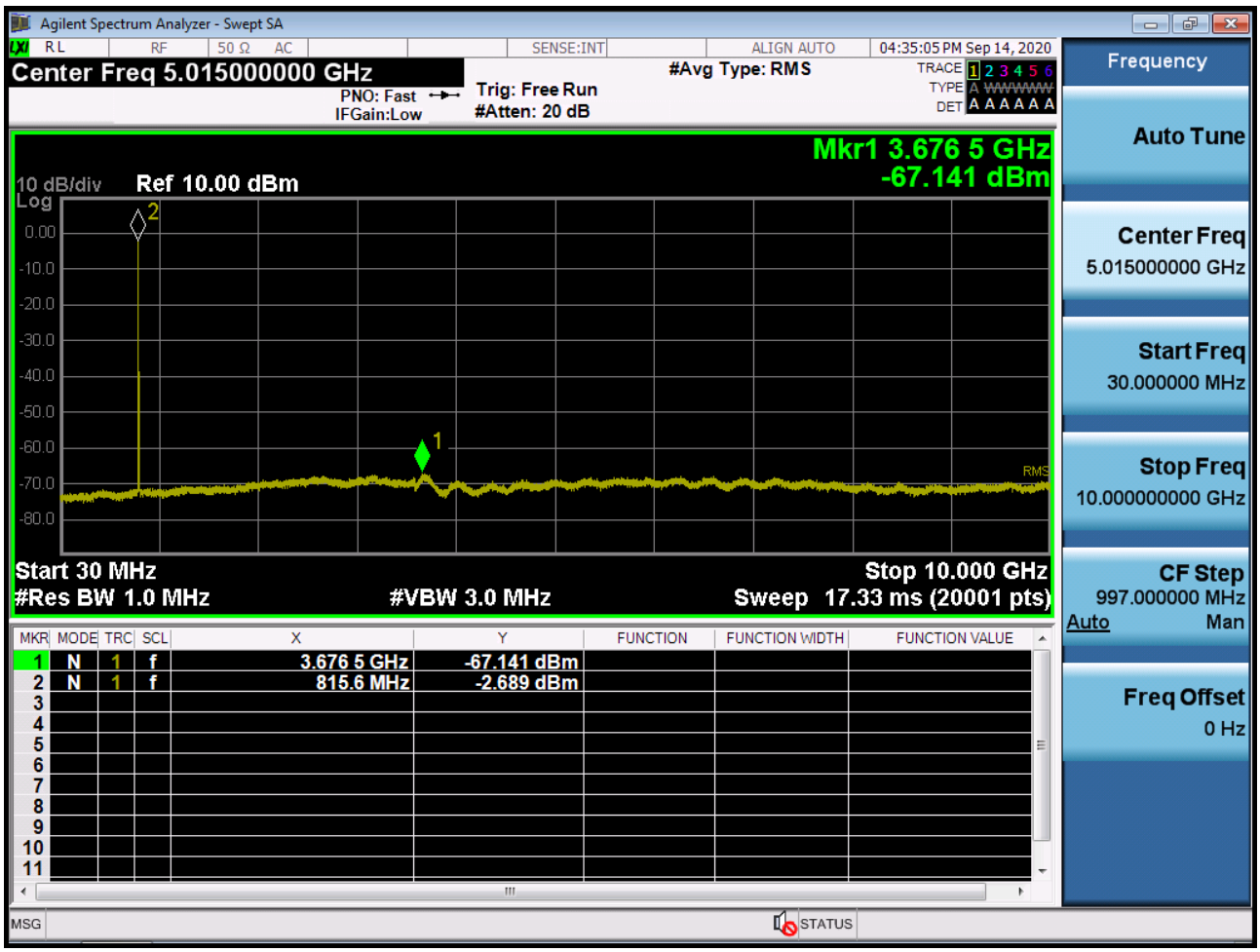
BAND 26. Conducted Spurious (26765 ch_5MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious (26740 ch_10MHz_QPSK_RB 1_0)

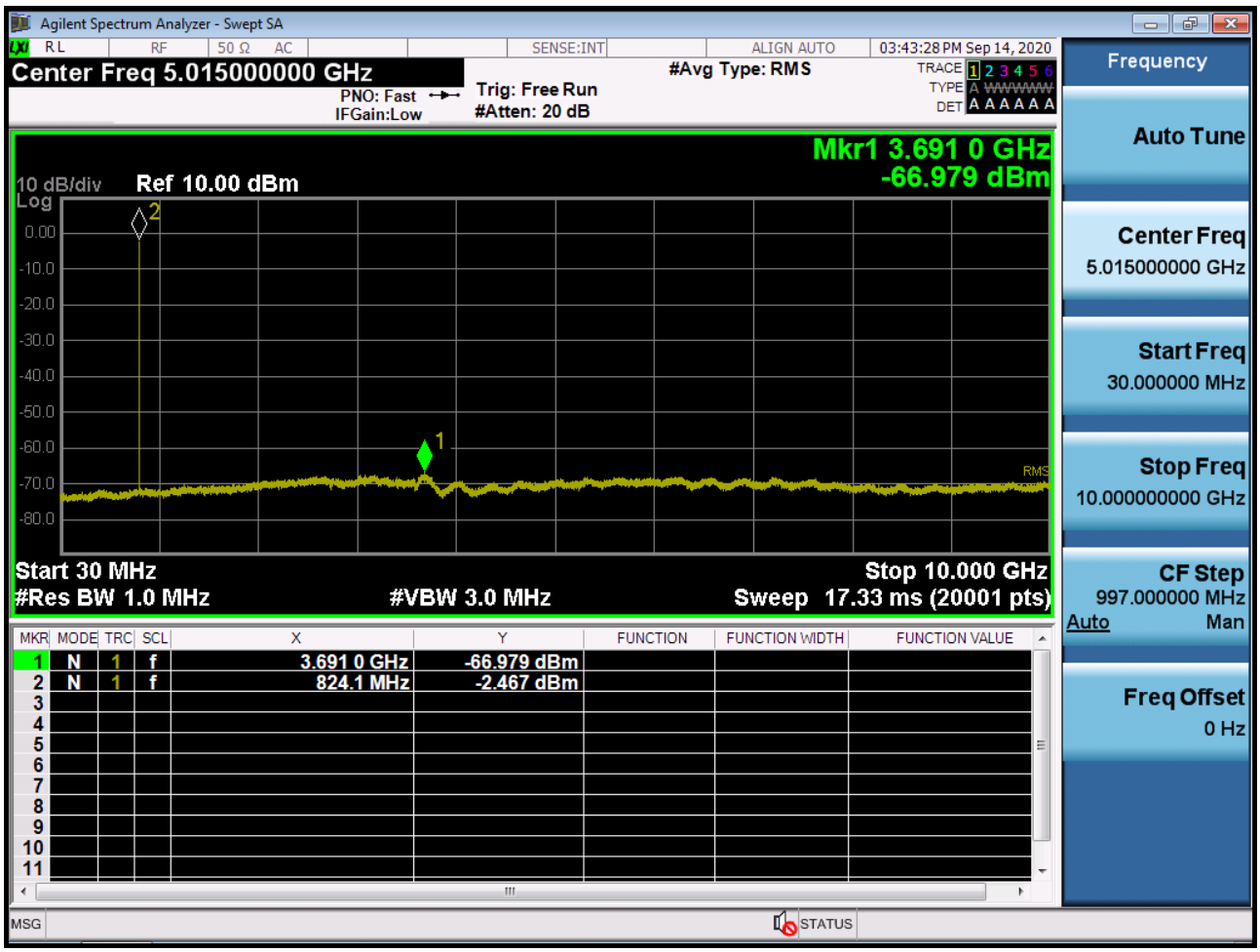


BAND 26. Conducted Spurious (26765 ch_15MHz_QPSK_RB 1_0)

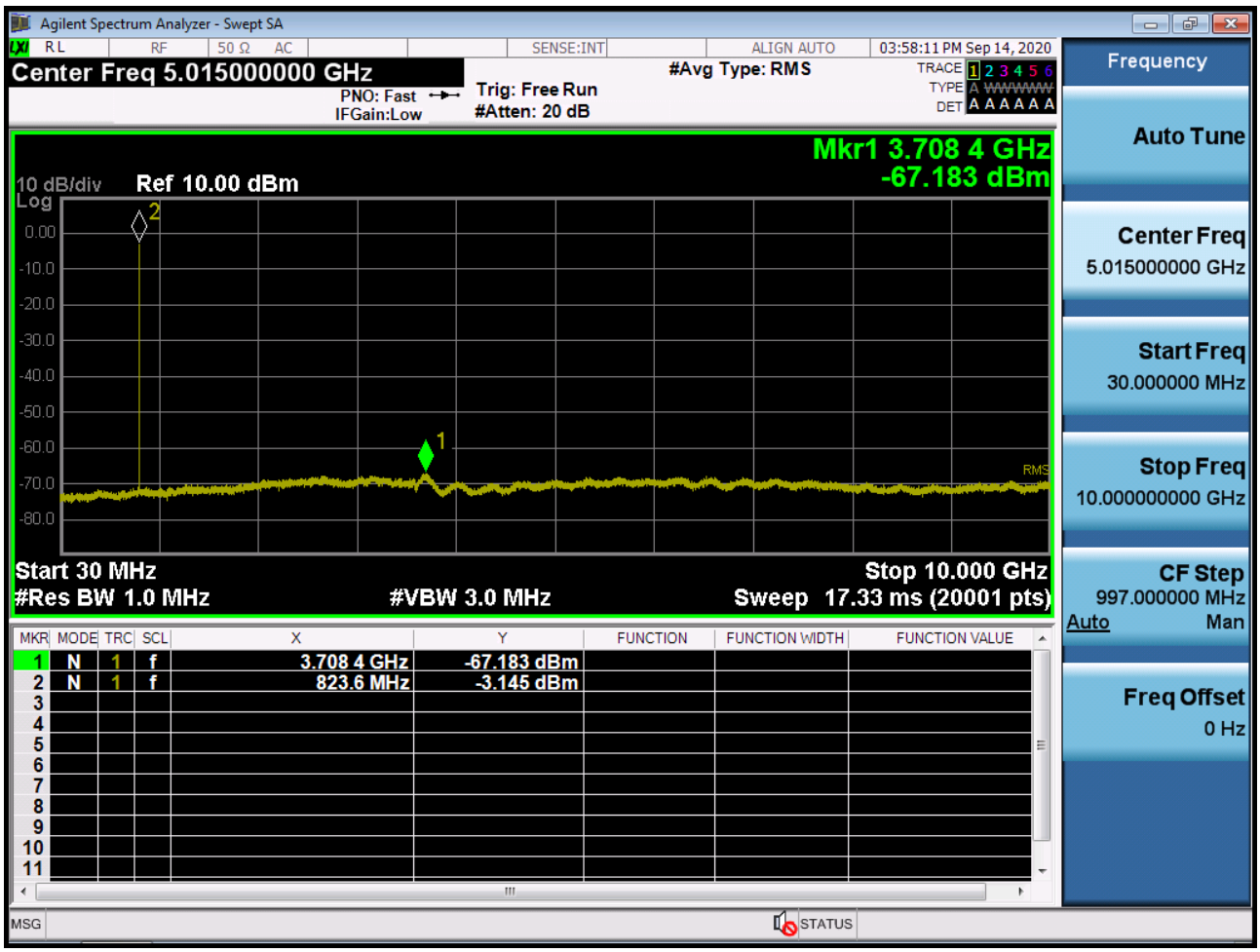


10. TEST PLOTS (STRADDLE CHANNEL)

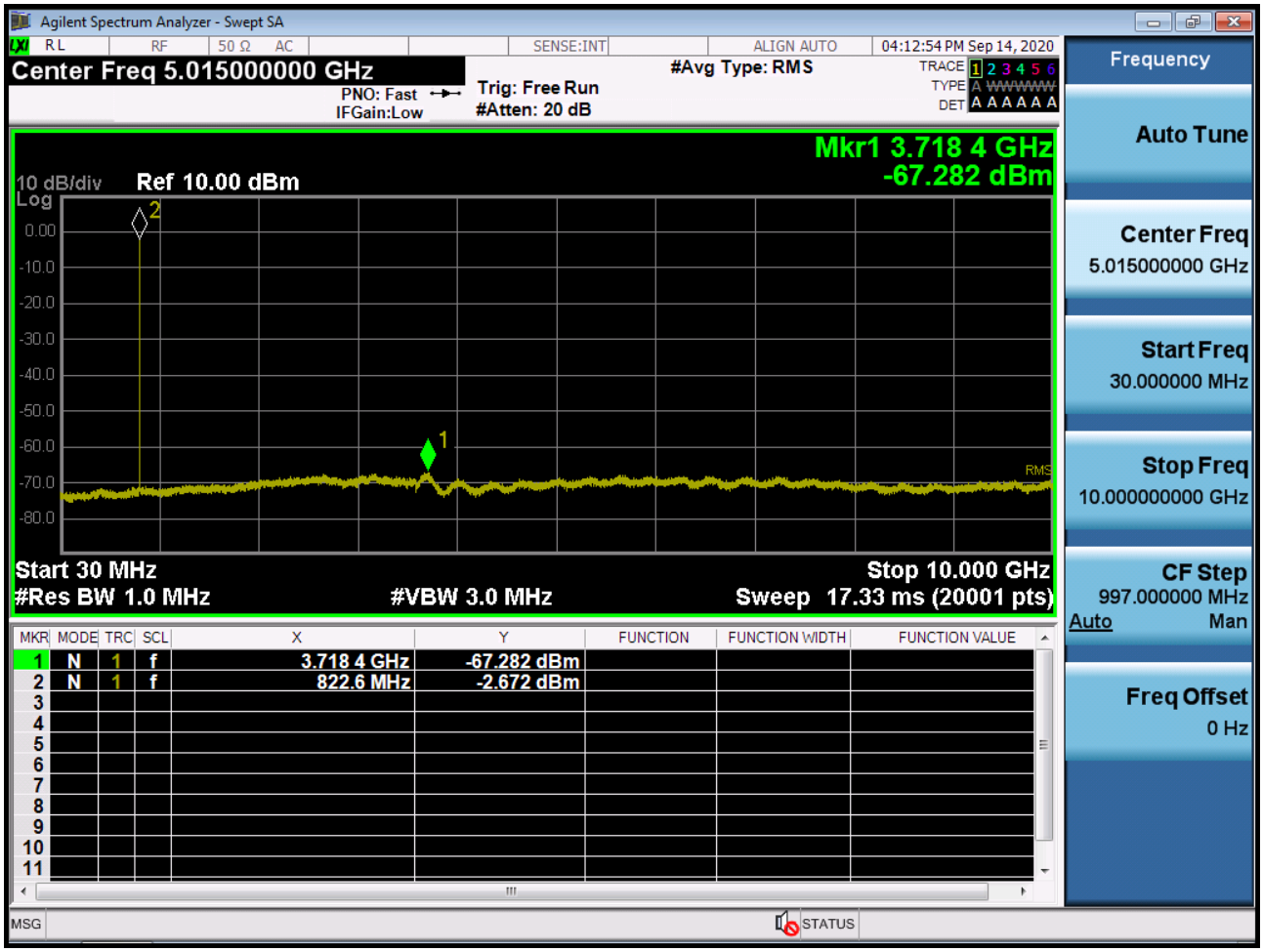
BAND 26. Conducted Spurious (1.4MHz_QPSK_RB 1_0)



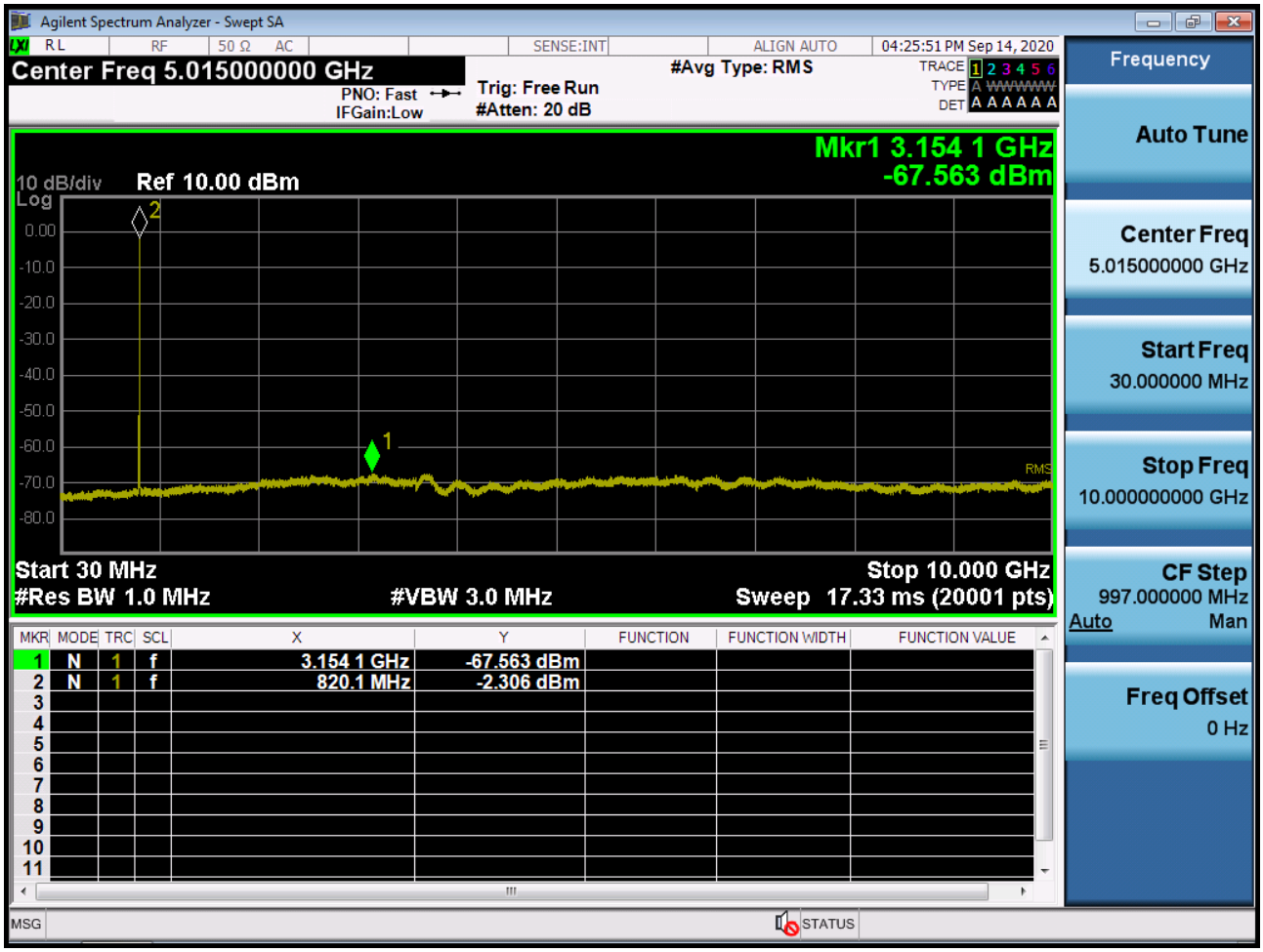
BAND 26. Conducted Spurious (3MHz_QPSK_RB 1_0)



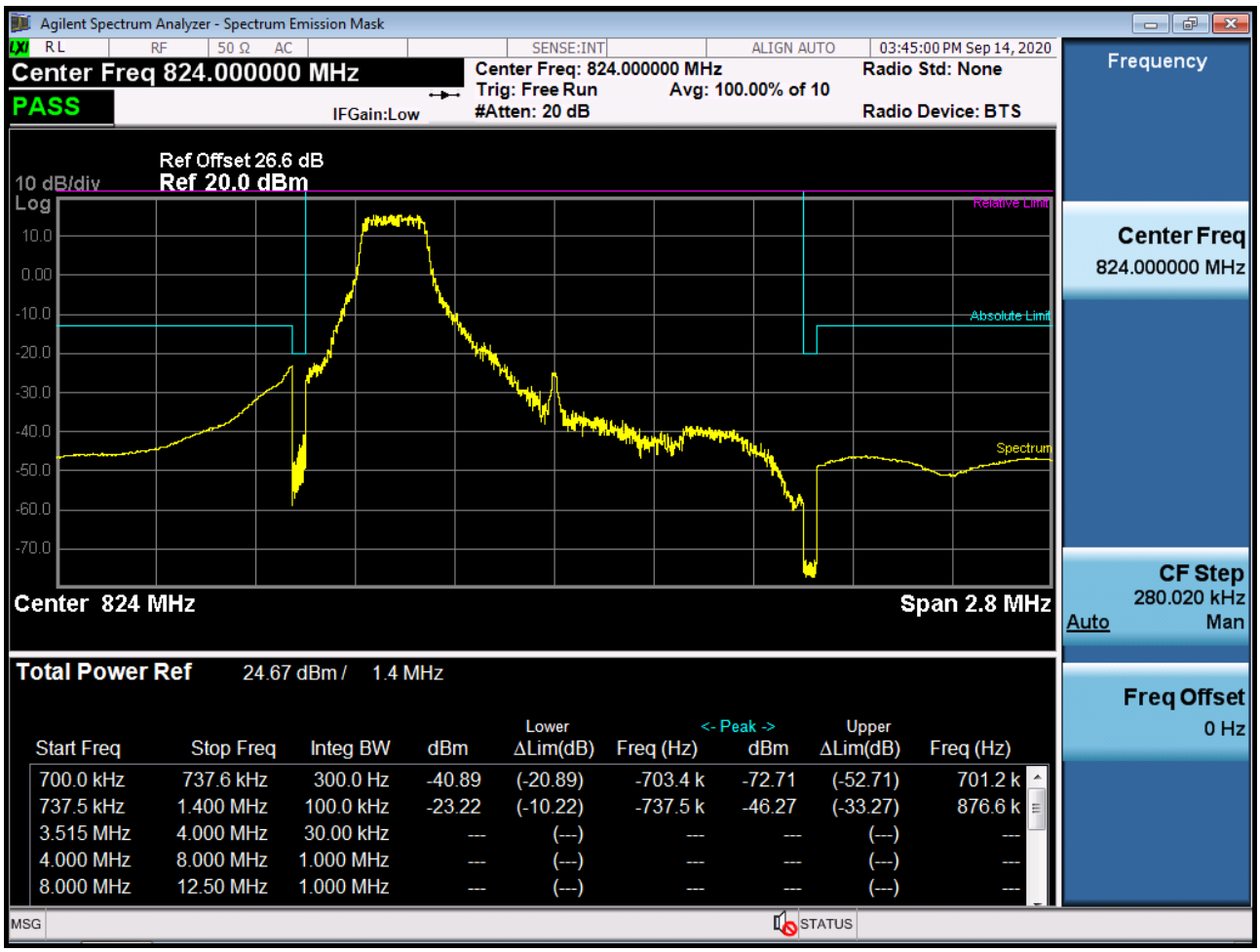
BAND 26. Conducted Spurious (5MHz_QPSK_RB 1_0)



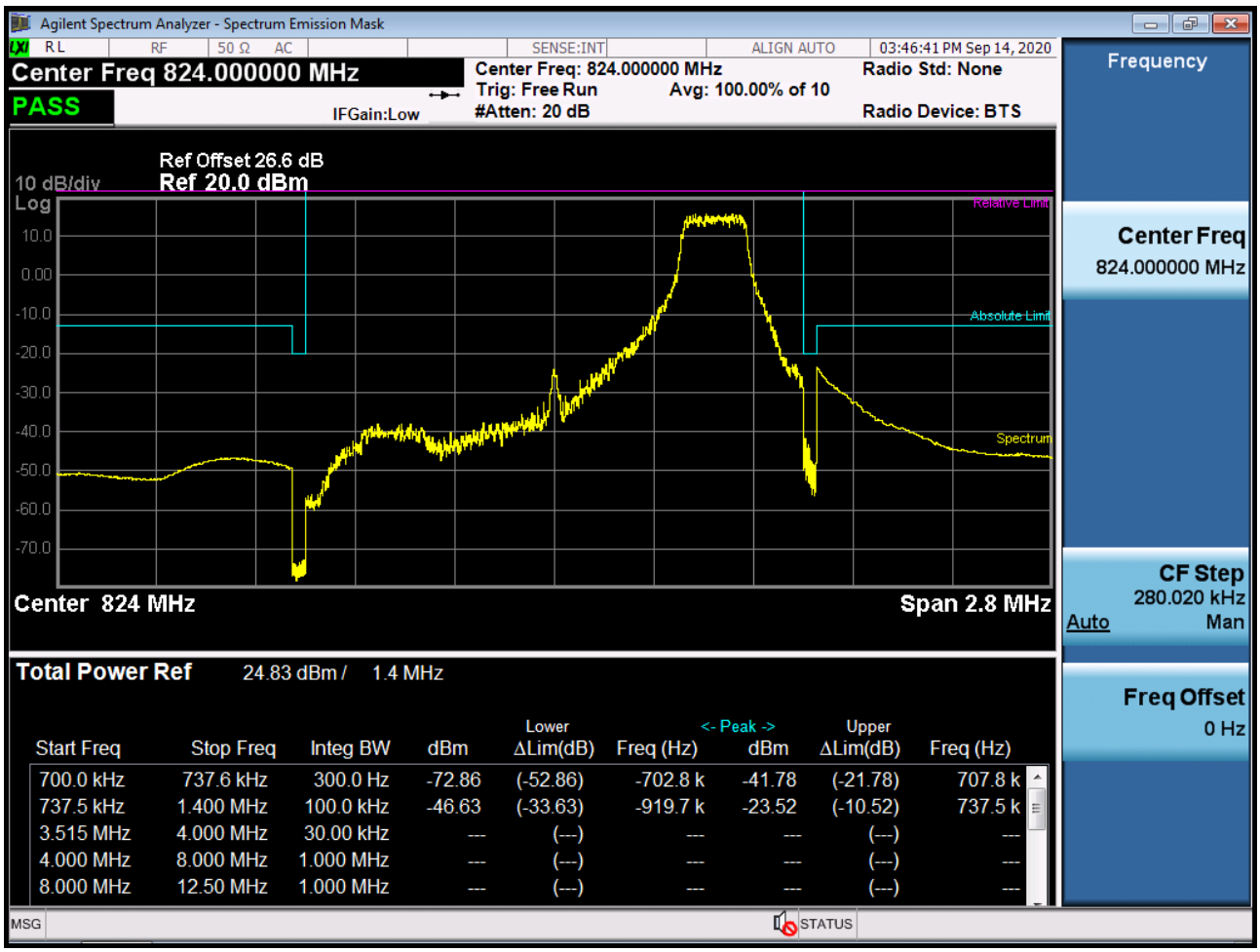
BAND 26. Conducted Spurious (10MHz_QPSK_RB 1_0)



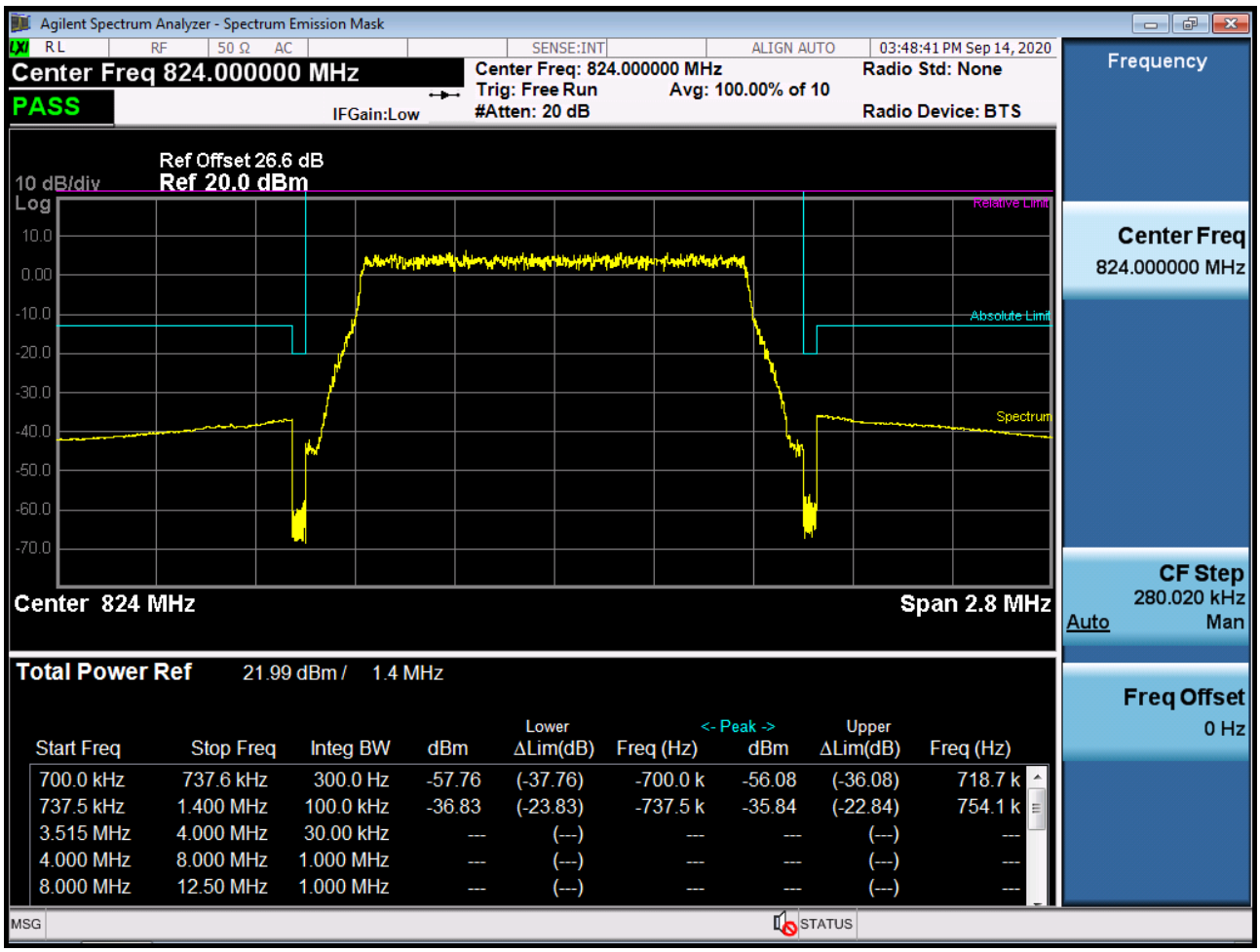
BAND 26. Channel Edge (1.4MHz_QPSK_RB 1_0)



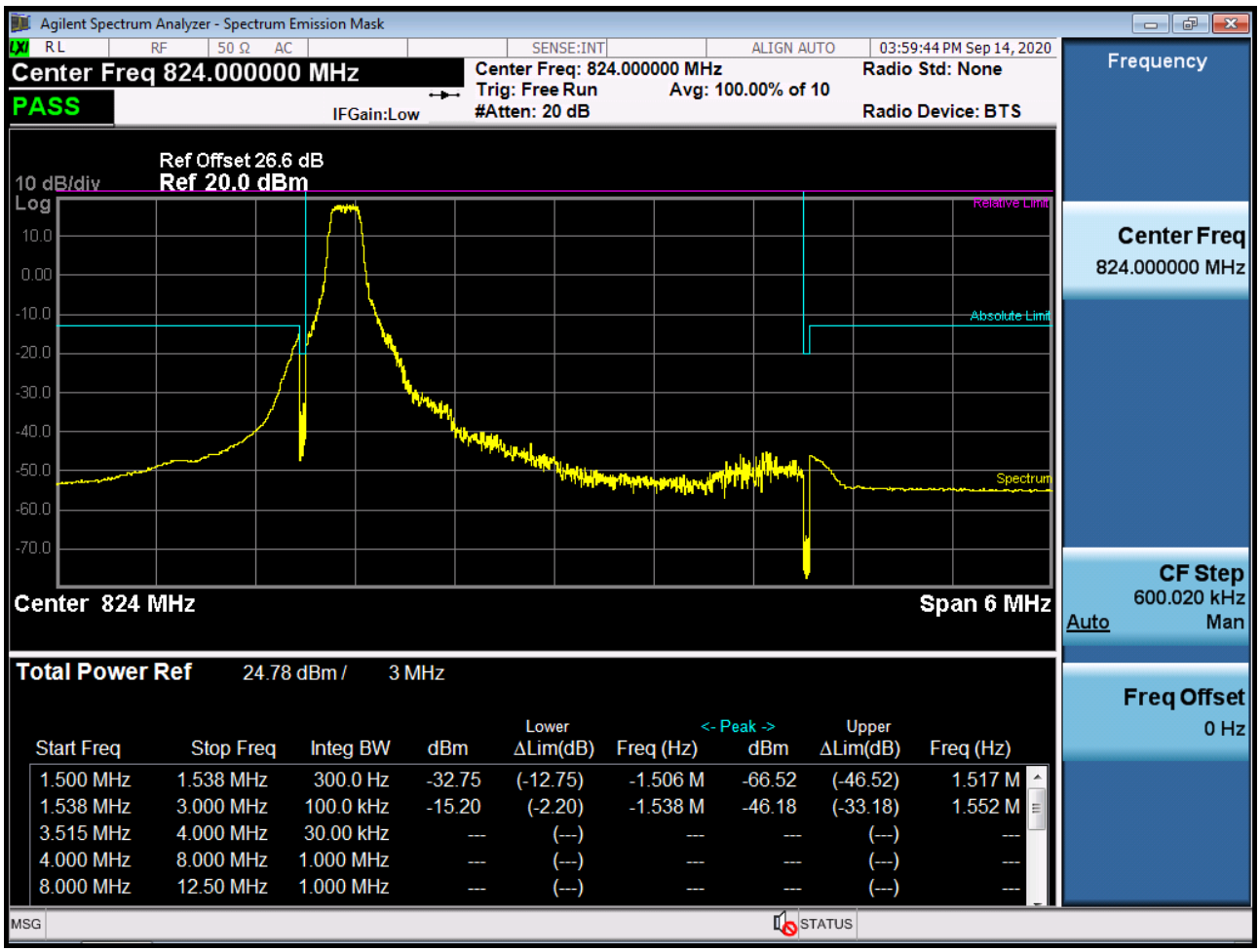
BAND 26. Channel Edge (1.4MHz_QPSK_RB 1_5)



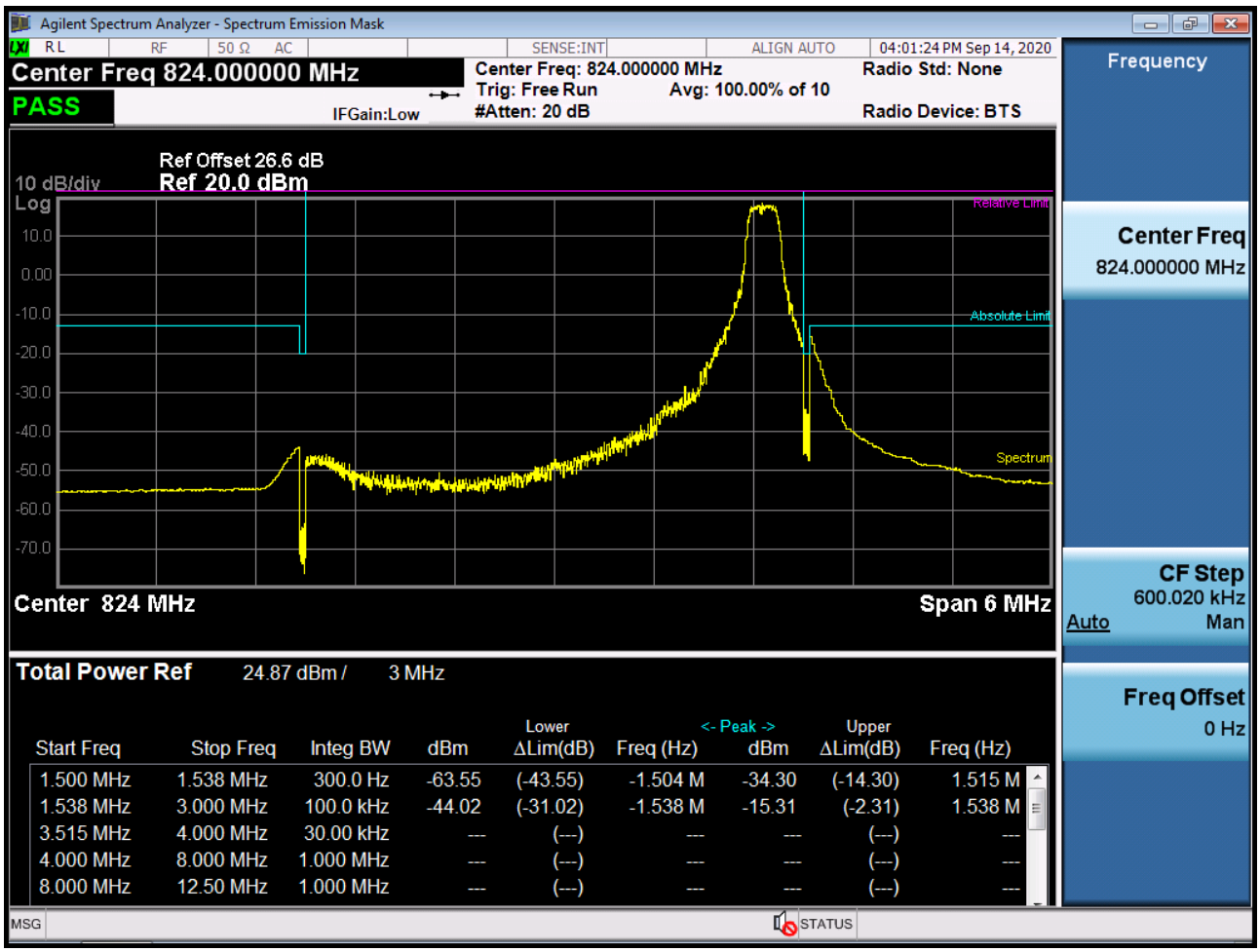
BAND 26. Channel Edge (1.4MHz_QPSK_Full RB)



BAND 26. Channel Edge (3MHz_QPSK_RB 1_0)

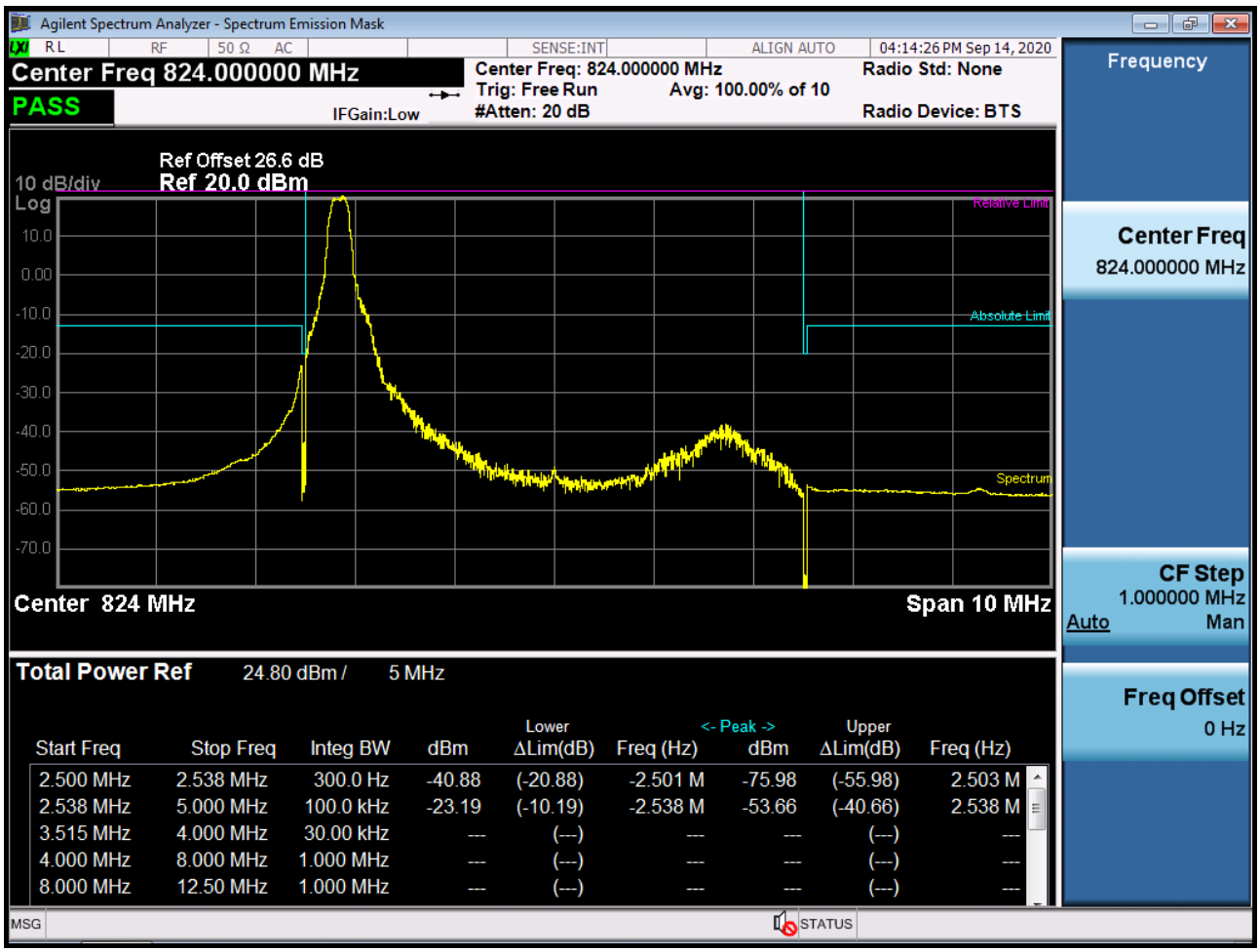


BAND 26. Channel Edge (3MHz_QPSK_RB 1_14)

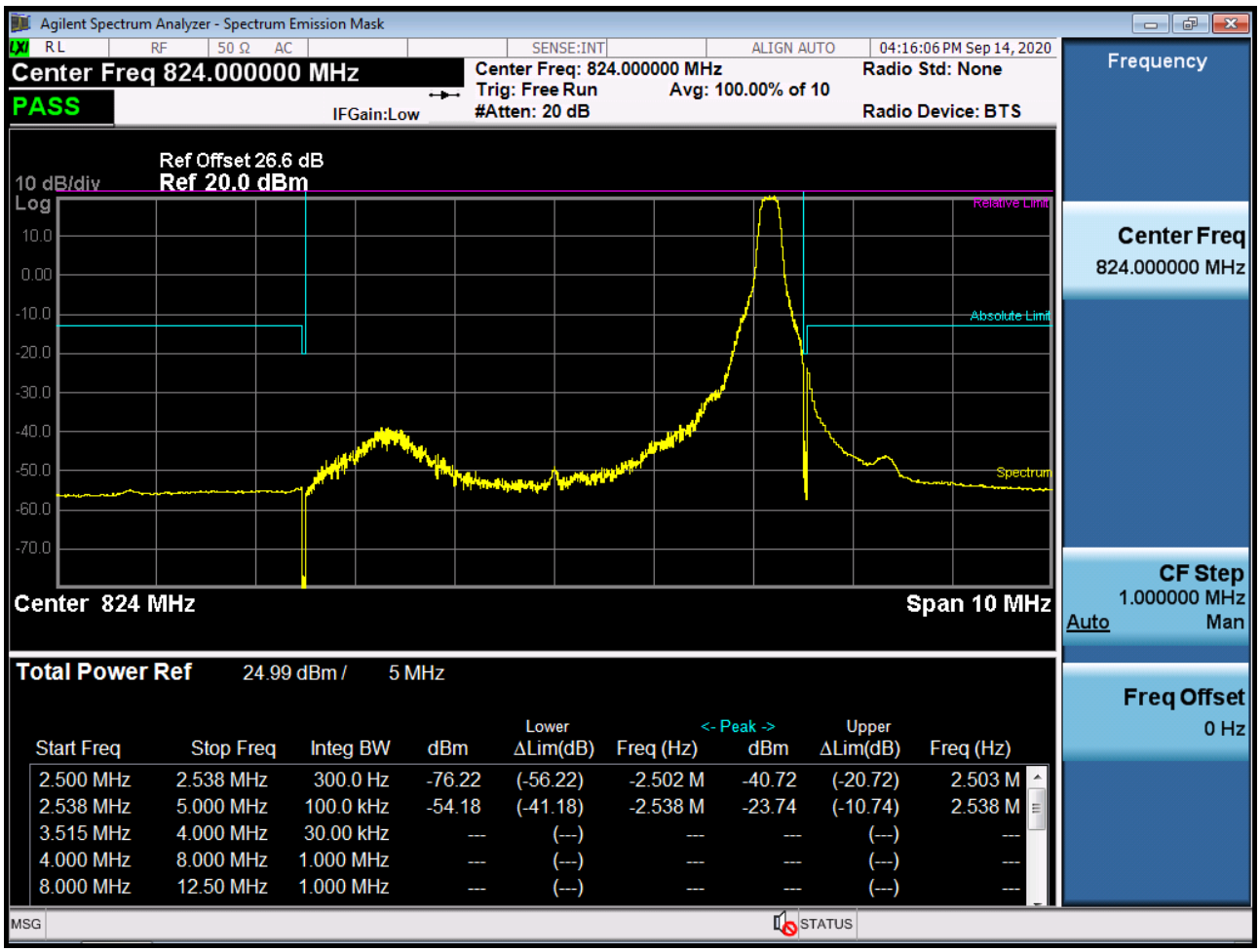


BAND 26. Channel Edge (3MHz_QPSK_Full RB)

BAND 26. Channel Edge (5MHz_QPSK_RB 1_0)

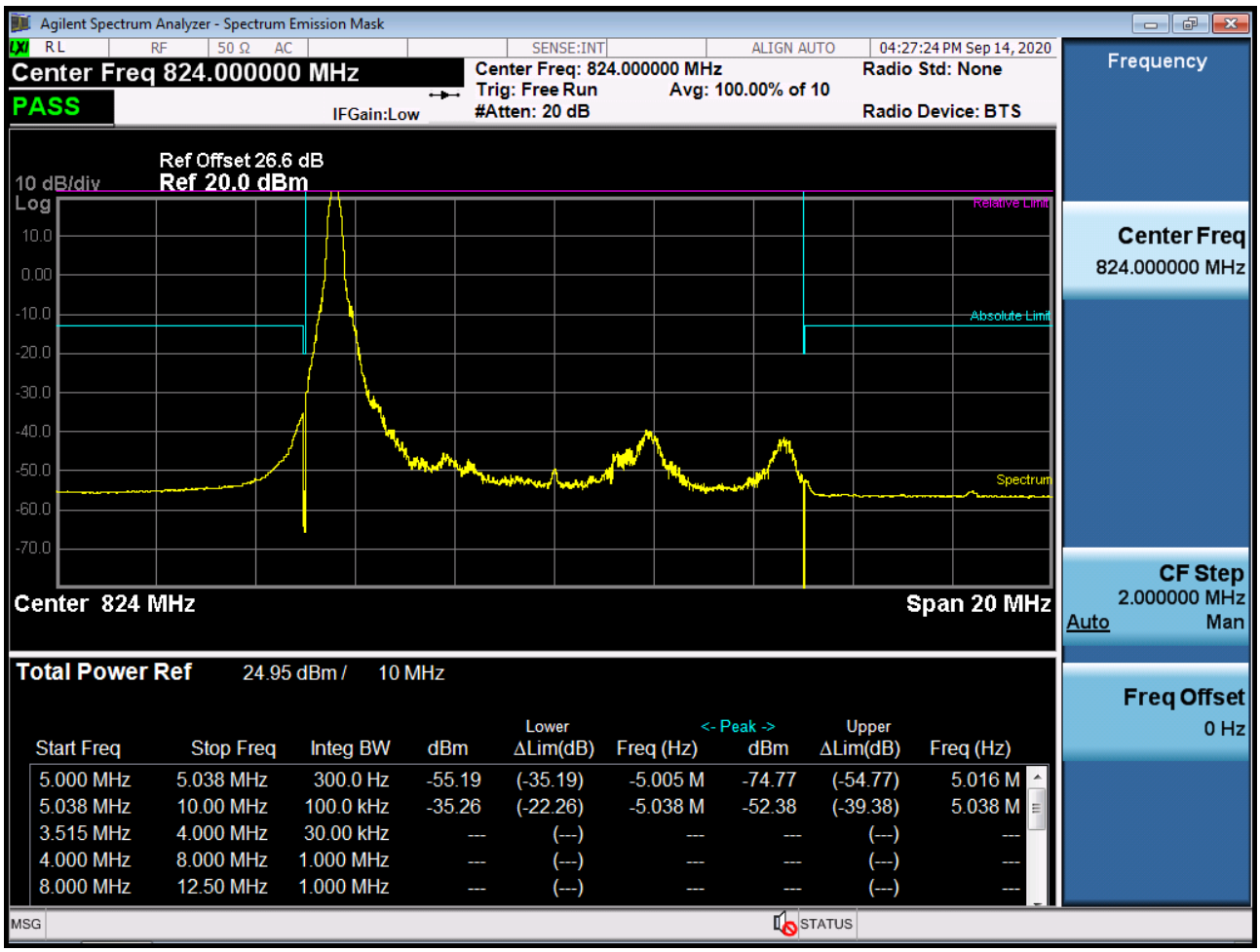


BAND 26. Channel Edge (5MHz_QPSK_RB 1_24)

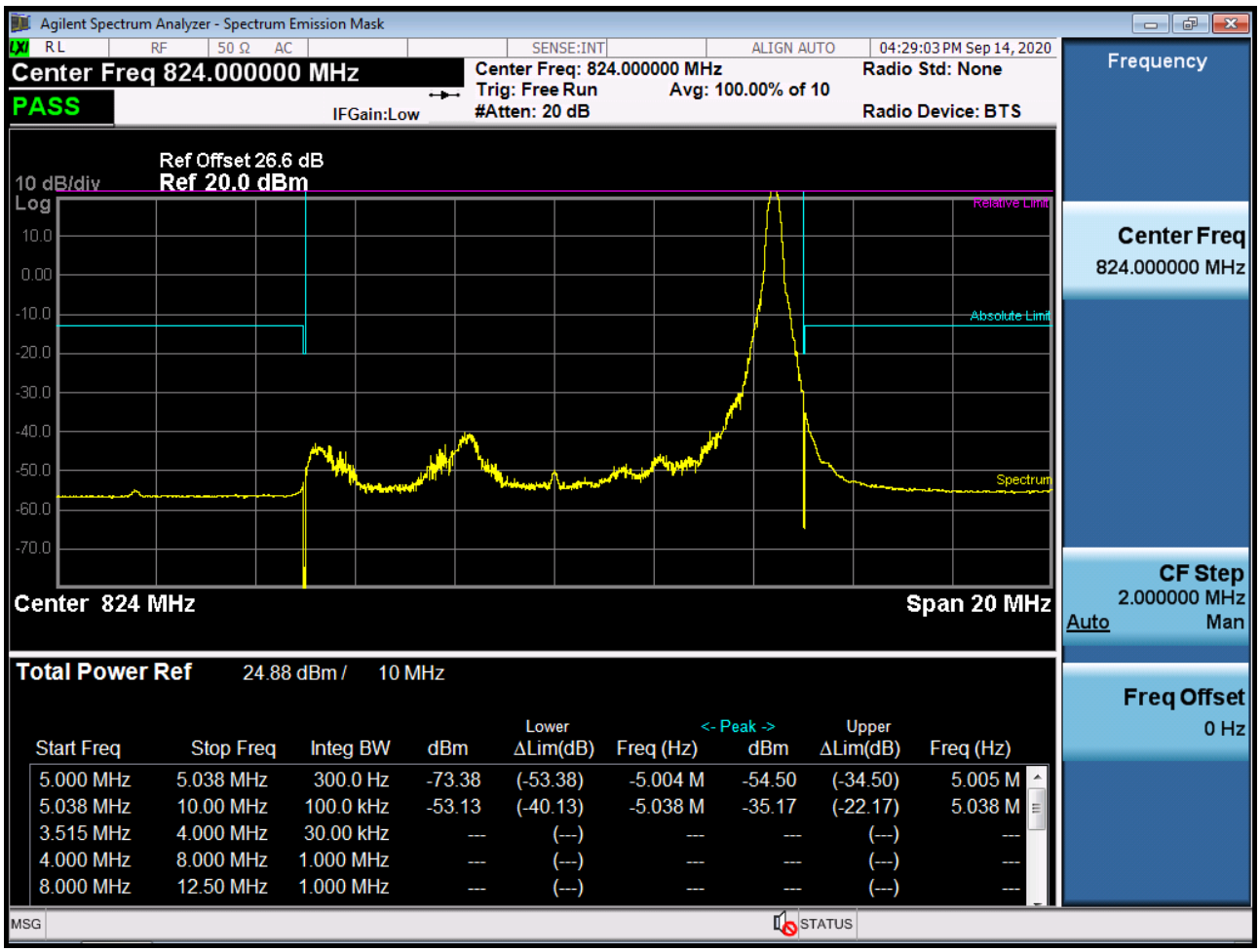


BAND 26. Channel Edge (5MHz_QPSK_Full RB)

BAND 26. Channel Edge (10MHz_QPSK_RB 1_0)

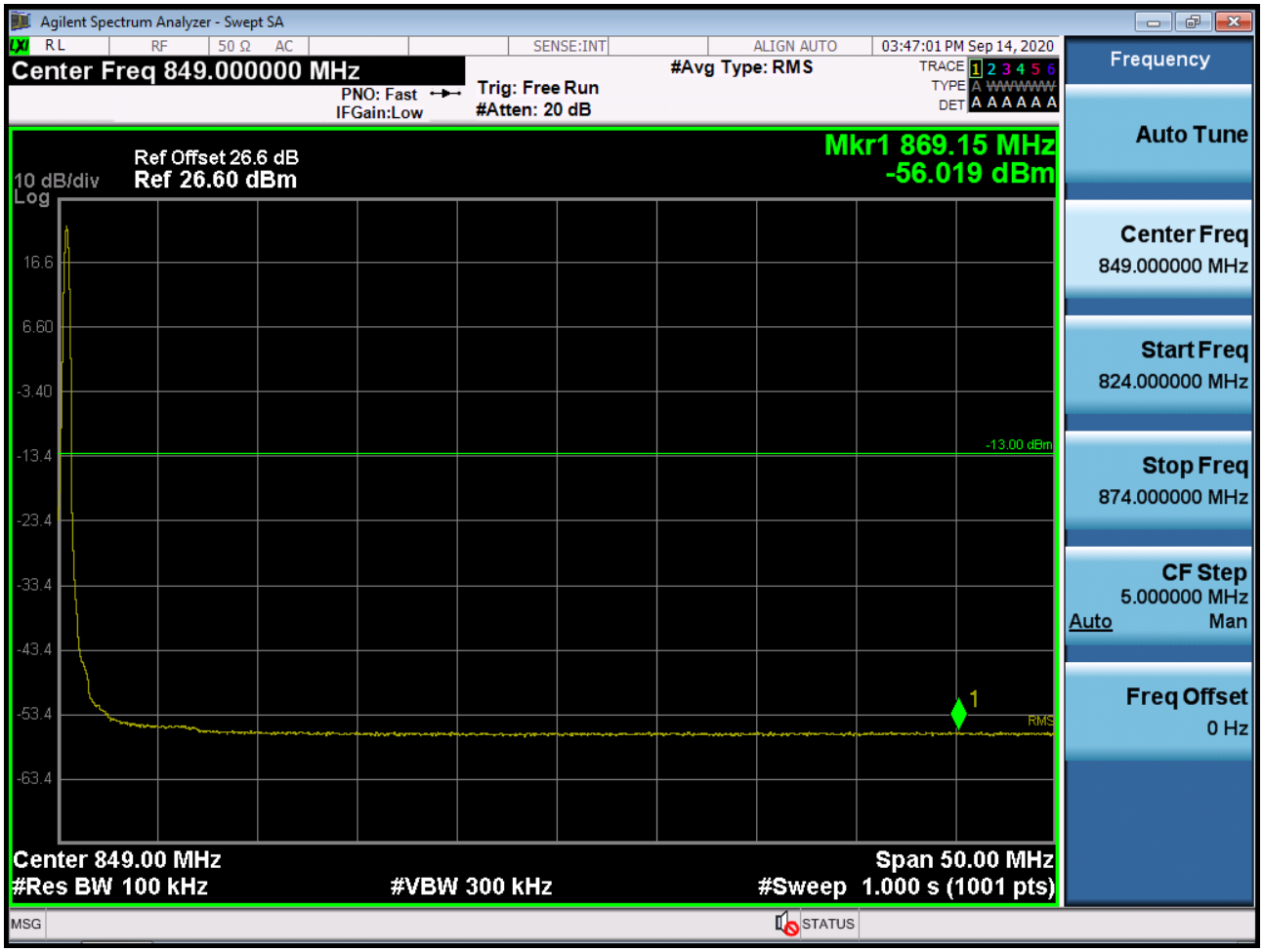


BAND 26. Channel Edge (10MHz_QPSK_RB 1_49)

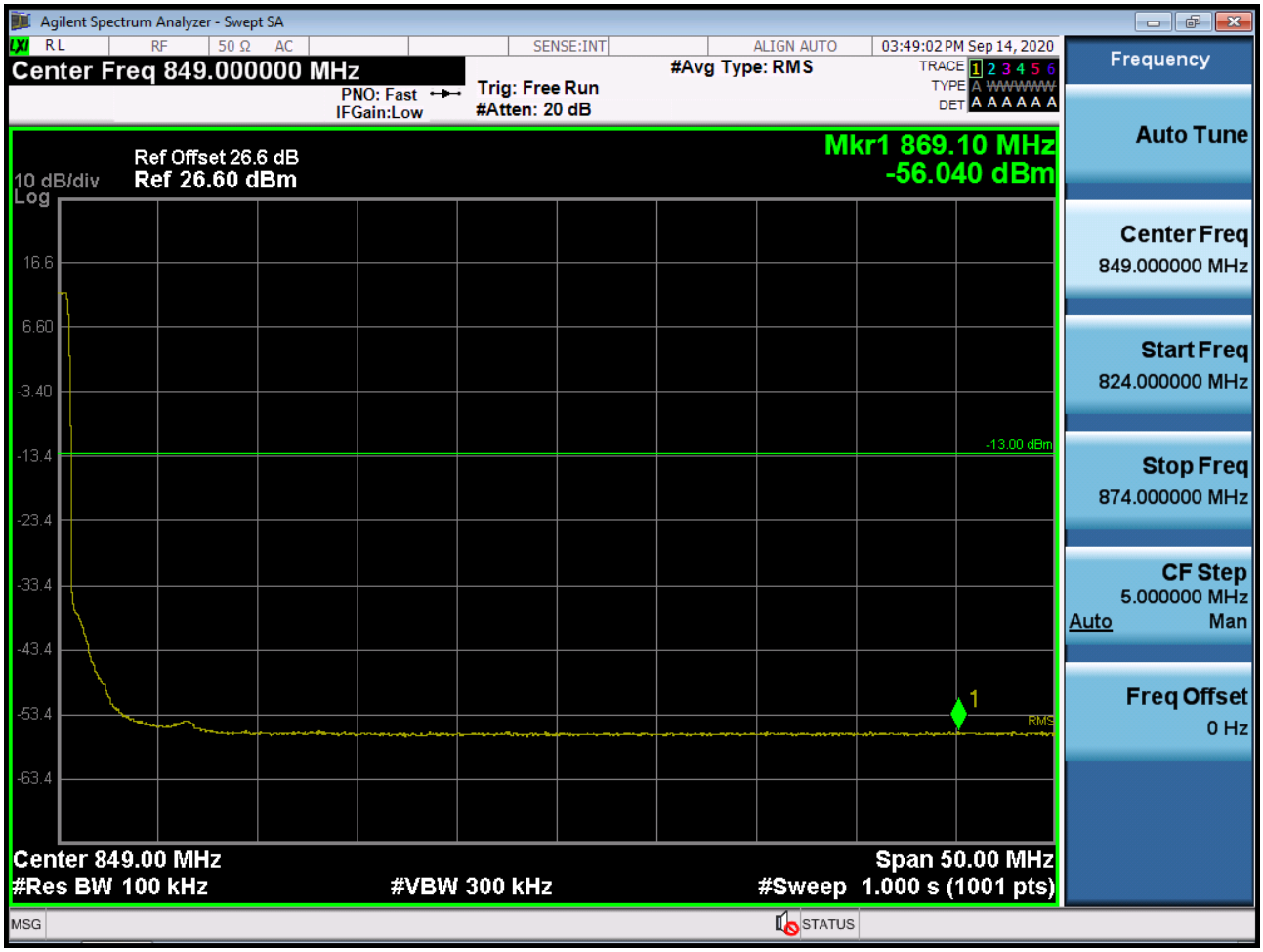


BAND 26. Channel Edge (10MHz_QPSK_Full RB)

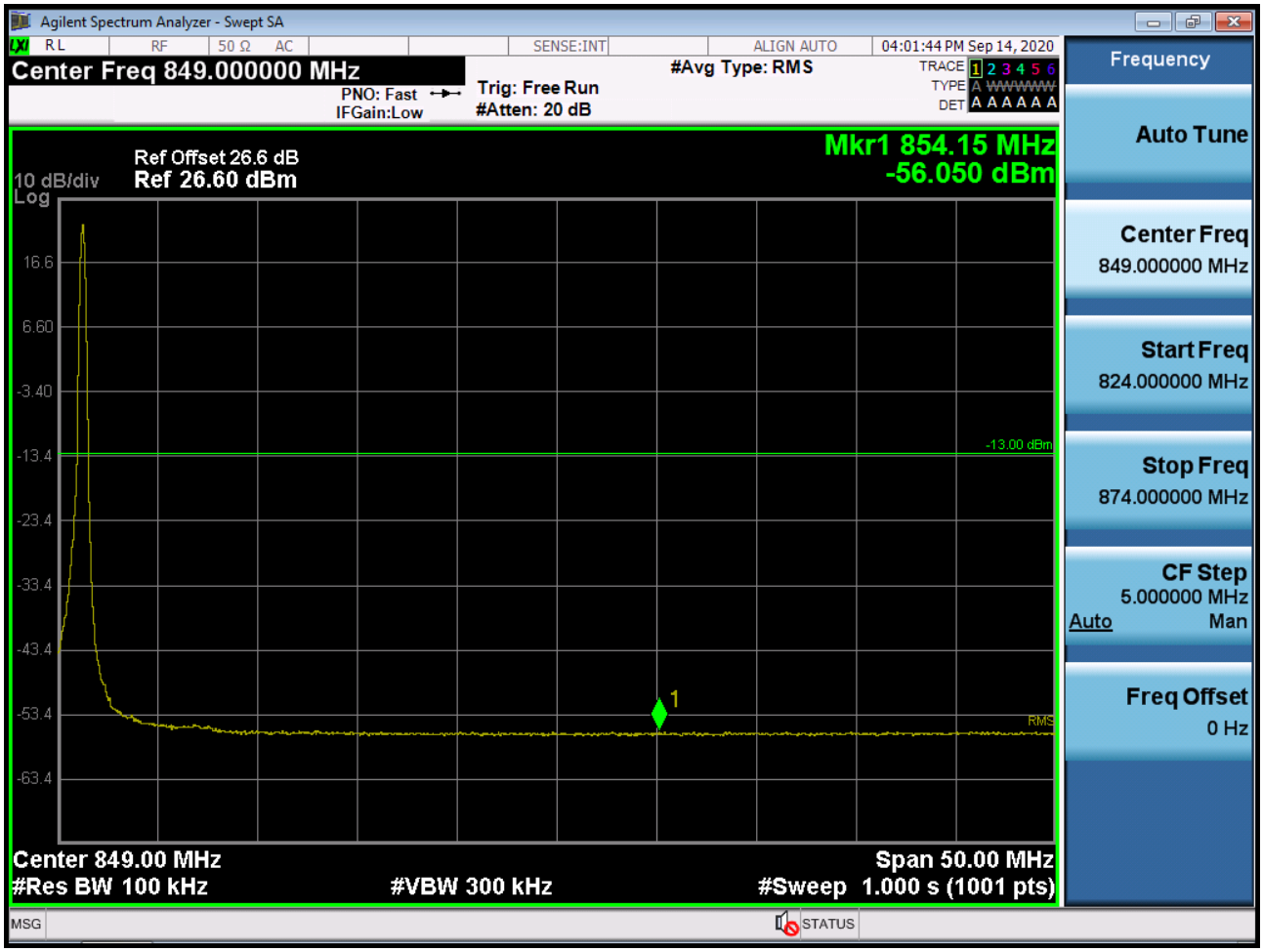
BAND 26. Band Edge (1.4MHz_QPSK_RB 1_5)



BAND 26. Band Edge (1.4MHz_QPSK_FullRB)



BAND 26. Band Edge (3MHz_QPSK_RB 1_14)



BAND 26. Band Edge (3MHz_QPSK_ Full RB)

BAND 26. Band Edge (5MHz_QPSK_RB 1_24)

BAND 26. Band Edge (5MHz_QPSK_ Full RB)

BAND 26. Band Edge (10MHz_QPSK_RB 1_49)

BAND 26. Band Edge (10MHz_QPSK_ Full RB)

11 ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2010-FC023-P